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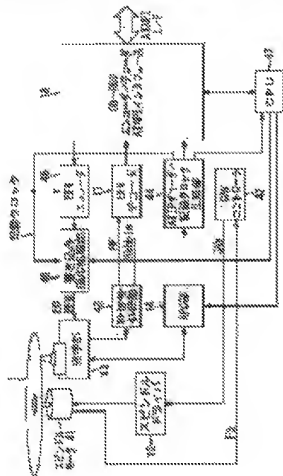
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(54) DISK DRIVE AND METHOD, AND RECORDING MEDIUM



(57)Abstract:

PROBLEM TO BE SOLVED: To attain the quick recording by recording data on an information recording medium based on a generated clock corresponding to a linear velocity signal which is generated corresponding to the linear velocity of a track to be recorded with the data of the mounted information recording medium.

SOLUTION: A wobble signal of the mounted CD-R1 corresponding to the linear velocity of a pit track is generated by an RF signal processing part 43. The recording clock corresponding to the wobble signal is produced by an ATIP decoder/recording clock generating part 44. By an EFM encoder 45 and a write-in adaptive processing part 46, the data are recorded on the CD-R1 based on the recording clock.

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CLAIMS

[Claim(s)]

[Claim 1] The disk driving gear characterized by including a linear-velocity signal
generation means to generate the linear-velocity signal corresponding to the linear
velocity of the truck with which the data of the information record medium with which it is
equipped are recorded, a clock generation means to generate the clock corresponding to
said linear-velocity signal, and a record means to record said data on said information
record medium based on said clock.

[Claim 2] Said linear-velocity signal is a disk driving gear according to claim 1
characterized by being generated from a Wobble signal.

[Claim 3] Said record means is a disk driving gear according to claim 1 characterized by
including further a driving signal amendment means to amend the driving signal which
drives said optical generating means, based on said clock including the optical generating
means which emits the light which records said data to said information record medium.

[Claim 4] The disk driving gear according to claim 1 characterized by including further the
adjustment device which adjusts the reinforcement of the laser beam which records data
to said information record medium of said record means based on said clock.

[Claim 5] The disk drive approach characterized by including the linear-velocity signal
generation step which generates the linear-velocity signal corresponding to the linear
velocity of the truck with which the data of the information record medium with which it is
equipped are recorded, the clock generation step which generates the clock corresponding
to said linear-velocity signal, and the record step which records said data on said
information record medium based on said clock.

[Claim 6] The record medium with which the program which the computer characterized
by to be included the linear-velocity signal generation step which generates the linear-
velocity signal corresponding to the linear velocity of the truck with which the data of the

information record medium with which it is equipped are recorded, the clock-generation step which generate the clock corresponding to said linear-velocity signal, and the record control step which control record of said data to said information record medium based on said clock can read is recorded.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a record medium at the disk driving gear which can do record for a disk driving gear and an approach, and a list quickly especially about a record medium and an approach, and a list.

[0002]

[Description of the Prior Art] CD-R (Compact Disc-Recordable) drive equipment records predetermined data on CD-R with which it was equipped, or reproduces predetermined data from CD-R. At this time, CD-R drive equipment applies a spindle servo so that CD-R may be rotated with the rotational speed which becomes fixed [the linear velocity of a predetermined pit track]. Moreover, a tracking servo, a focus servo, and a thread servo are applied so that the laser spot of the laser beam which the laser diode built in an optical pickup generates may follow the predetermined pit track of CD-R and can record or reproduce data.

[0003] The configuration of conventional CD-R drive equipment is explained with reference to the block diagram shown in drawing 1 . The spindle rotated with a spindle motor 11 with the rotational speed which becomes fixed [the linear velocity of a predetermined pit track] is equipped with CD-R1. The spindle driver 12 drives a spindle motor 11 so that it may become the rotational speed [be / fixed] based on the CLV (Constant Linear Velocity) signal supplied from the ATIP decoder 16 about the linear velocity of a predetermined pit track.

[0004] The optical department 13 irradiates light from the laser diode (not shown) to build in in the signal side of CD-R1. The existence and the guide rail (it is also called PURIGURUBU or the guide groove) of a signal (pit) become irregular, and the light reflected from the signal side of CD-R1 is received with the detector of the optical department 13. The detector of the optical department 13 changes the light from CD-R1

into an electrical signal, and outputs it to RF (Radio Frequency) processing section 15.

[0005] The optical department 13 changes the output of a laser diode again based on the data which were supplied from the write-in adaptation processing section 21 and by which the EQFEM modulation was carried out, when writing data in CD-R1. The optical department 13 is driven to radial [of CD-R1] by the thread motor which is not illustrated.

[0006] The APC (Auto Power Control) section 14 adjusts the output of the laser diode of the optical department 13 based on control of CPU (Central Processing Unit) 19.

[0007] From the signal detected with the detector, RF processing section 15 generates the regenerative signal (a RF signal is called hereafter) corresponding to a pit, and outputs it to the EFM (Eight to Fourteen Modulation) decoder 17. From the signal detected with the detector, RF processing section 15 generates the Wobble signal corresponding to a guide rail, and outputs it to the ATIP decoder 16. Since the linear velocity of a pit track is fixed, a Wobble signal has a 22.05kHz*1kHz frequency, while recording data on CD-R1, or when having read data in CD-R1.

[0008] Moreover, the frequency modulation of the Wobble signal is carried out, and since the linear velocity of a pit track is fixed, the clock frequency of the signal which restored to it has the fixed frequency of 6.30kHz, while recording data on CD-R1, or when having read data in CD-R1.

[0009] RF processing section 15 performs addition-and-subtraction processing of the signal detected with the detector again, generates a tracking error signal (TE (Tracking Error) signal is called hereafter) and a focal error signal (FE (Focus Error) signal is called hereafter), and outputs them to the servo driver which controls a tracking servo, a focus servo, and a thread servo and which is not illustrated.

[0010] The ATIP decoder 16 outputs the data in which rotation of a spindle is shown to a CD-ROM (Compact Disc-Read Only Memory) encoder / decoder ATAPI (AT Attachment Packet Interface) interface 18 while the optical department 13 generates the CLV signal which shows the linear velocity of the pit track which is irradiating light and supplies it to the spindle driver 12 based on the Wobble signal supplied from RF processing section 15.

[0011] The EFM decoder 17 carries out the EFM recovery of the RF signal generated in RF processing section 15, changes it into the format for CD-ROM, and is outputted to a CD-ROM encoder / decoder ATAPI interface 18.

[0012] A CD-ROM encoder / decoder ATAPI interface 18 supplies the data supplied from the external device to the EFM encoder 20 while outputting the data supplied from the ATIP decoder 16 or the EFM decoder 17 through an ATAPI interface to the radical of control of CPU19 at an external device.

[0013] CPU19 controls a CD-ROM encoder / decoder ATAPI interface 18, the write-in adaptation processing section 21, and the APC section 14 based on the data inputted from the CD-ROM encoder / decoder ATAPI interface 18.

[0014] The EFM encoder 20 generates the EFM signal corresponding to the data inputted from the CD-ROM encoder / decoder ATAPI interface 18, and outputs it to the write-in adaptation processing section 21 with the record clock of the frequency of immobilization.

[0015] Based on the EFM signal and record clock which were supplied from the EFM encoder 20, the write-in adaptation processing section 21 generates an EQEFM (Equalized EFM) signal, and supplies it to the optical department 13.

[0016] Thus, conventional CD-R drive equipment applies a spindle servo so that data may be rotated with the rotational speed from which the linear velocity of the pit track which is carrying out record or read-out becomes fixed.

[0017]

[Problem(s) to be Solved by the Invention] However, conventional CD-R drive equipment must wait for the engine speed of CD-R1 to change, and requires time amount for record of the data to CD-R1 until the linear velocity of a pit track to record becomes fixed.

[0018] This invention is made in view of such a situation, and it aims at being made to be possible [record] quickly.

[0019]

[Means for Solving the Problem] A disk driving gear according to claim 1 is characterized by including a linear-velocity signal generation means to generate the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, a clock generation means to generate the clock corresponding to a linear-velocity signal, and a record means to record data on an information record medium based on a clock.

[0020] A linear-velocity signal is generable from a Wobble signal.

[0021] A record means can establish further a driving signal amendment means to amend the driving signal which drives an optical generating means, based on a clock including the optical generating means which emits the light which records data to an information record medium.

[0022] A disk driving gear can prepare further the adjustment device which adjusts the reinforcement of the laser beam which records data to the information record medium of a record means based on a clock.

[0023] The disk drive approach according to claim 5 is characterized by including the linear-velocity signal generation step which generates the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, the clock generation step which generates the clock corresponding to a linear-velocity signal, and the record step which records data on an information record medium based on a clock.

[0024] A record medium according to claim 6 is characterized by to be recorded the program which the computer which performs processing containing the linear-velocity signal generation step which generates the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, the clock-generation step which generates the clock corresponding to a linear-velocity signal, and the record control step which control record of the data to an information record medium based on a clock can read.

[0025] In a disk driving gear according to claim 1, the disk drive approach according to claim 5, and a record medium according to claim 6, the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded is generated, the clock corresponding to a linear-velocity signal is generated, and data are recorded on an information record medium based on a clock.

[0026]

[Embodiment of the Invention] Drawing 2 is the block diagram showing the configuration of the gist of 1 operation of the CD-R drive equipment concerning this invention. The same sign is given to the conventional case and the corresponding part, and the explanation is omitted suitably. A spindle motor 41 rotates a spindle with a predetermined rotational speed which is a constant angular velocity. CD-R1 with which the spindle is equipped rotates with a predetermined rotational speed which is a constant angular velocity. A spindle motor 41 outputs the electrical potential difference proportional to the rotational speed of a spindle to the CAV (Constant Angular Velocity) controller 42 as a FG (Frequency Generator) signal.

[0027] Based on FG signal supplied from the spindle motor 41, the CAV controller 42 controls the spindle driver 12 so that a spindle motor 41 rotates with a predetermined rotational speed which is a constant angular velocity.

[0028] From the signal detected with the detector, RF processing section 43 generates the Wobble signal corresponding to a guide rail, and outputs it to an ATIP decoder / record clock generation section 44 while it generates RF ** corresponding to a pit and outputs it to the EFM decoder 17 from the signal detected with the detector. The frequency and a recovery frequency change with the locations of the pit track with which it recorded or read and the optical department 13 is carrying out the Wobble signal which RF processing section 43 of the CD-R drive equipment concerning this invention outputs to an ATIP decoder / record clock generation section 44 since the angular velocity of CD-R1 is fixed.

[0029] An ATIP decoder / record clock generation section 44 outputs the data in which rotation of a spindle is shown to a CD-ROM encoder / decoder ATAPI interface 18 while it generates the record clock of the predetermined frequency corresponding to the frequency and recovery frequency of a Wobble signal based on the Wobble signal supplied from RF processing section 43 and supplies it to the EFM encoder 45, the write-in adaptation processing section 46, and CPU47.

[0030] From the data inputted from the CD-ROM encoder / decoder ATAPI interface 18, the EFM encoder 45 generates an EFM signal based on the record clock supplied from an ATIP decoder / record clock generation section 44, and outputs it to it at the write-in adaptation processing section 46.

[0031] Based on the EFM signal supplied from the EFM encoder 45, and the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 generates an EQEFM signal, and supplies it to the optical department 13. The write-in adaptation processing section 46 controls the reinforcement of the laser beam to which the optical department 13 irradiates CD-R1 based on the data supplied from CPU47.

[0032] CPU47 generates data for the write-in adaptation processing section 46 to control the reinforcement of the laser beam of the optical department 13 based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, and outputs them to the write-in adaptation processing section 46.

[0033] When recording data on CD-R1, the optical department 13 changes the reinforcement of a laser beam based on the EQEFM signal supplied from the write-in adaptation processing section 46.

[0034] Drawing 3 is drawing showing the configuration of the detector of the optical department 13, and RF signal-processing section 43. The optical department 13 irradiates the laser beam by which outgoing radiation was carried out from the laser diode to build in in the signal side of CD-R1. One laser beam irradiated is divided into one laser beam for signal reading (record), and two laser beams for tracking servos by the grating (diffraction grating) which is not illustrated at this time. That is, one laser beam is divided into three laser beams by the grating. And three laser beams from the reflector acquired by irradiating three laser beams in the signal side of CD-R1 are received by the detector 71-1 thru/or 71-3, respectively.

[0035] After the quadrisectioned sensors A and D detect a detector 71-1 and it carries out ***** conversion at electrical signals AP, BP, CP, and DP, it outputs the laser beam for signal reading reflected from CD-R1 to amplifier 72-1 thru/or 72-4. Amplifier 72-1 thru/or 72-4 amplify Signals AP and DP, respectively, and outputs them to an adder 73.

[0036] An adder 73 is adding the signals AP, BP, CP, and DP amplified by amplifier 72-1 thru/or 72-4 according to a degree type (1), generates a RF signal and outputs it to the EFM decoder 17.

[0037]

$RF = (AP + BP + CP + DP) \dots (1)$

Amplifier 72-1 thru/or 72-4 output Signals AP, BP, CP, and DP to the Maine sample hold circuit 74 again, respectively.

[0038] The Maine sample hold circuit 74 outputs those signals to amplifier 75 while carrying out sample hold of the signals AP, BP, CP, and DP until the activity of predetermined A/D (Analog To Digital) conversion ends. Before it carries out sample hold of the signals AP, BP, CP, and DP, outputs them and writes data in CD-R1, or after writing in the Maine sample hold circuit 74 while writing data in CD-R1, only a sample performs Signals AP, BP, CP, and DP (** which is not held), and it outputs them to amplifier 75.

[0039] Amplifier 75 outputs the signal which added the inputted signals BP and CP, and added and generated them to AGC circuit 77 while outputting the signal which added the inputted signals AP and DP, and added and generated them to the AGC (Automatic Gain Control) circuit 76.

[0040] Amplifier 75 calculates the inputted signals AP, BP, CP, and DP again according to a degree type (2), and generates FE signal.

[0041]

$FE = (AP + CP) - (BP + DP) \dots (2)$

Further, from the inputted signals AP, BP, CP, and DP, according to a degree type (3), amplifier 75 calculates an MPP (Main Push Pull) signal, and outputs it to a switch 79 and + input terminal of the differential amplifier 85.

[0042]

$MPP = (AP + DP) - (BP + CP) \dots (3)$

AGC circuit 76 adjusts the amplitude so that the level of the signal adding the inputted signals AP and DP may be set to the same level as reference level as compared with predetermined reference level, and it outputs it to + input terminal of the differential amplifier 78.

[0043] AGC circuit 77 adjusts the amplitude so that the level of the signal adding the inputted signals BP and CP may be set to the same level as reference level as compared with predetermined reference level, and it outputs it to - input terminal of the differential amplifier 78.

[0044] The differential amplifier 78 computes the difference of the signal adding the signals AP and DP with which the amplitude was adjusted, and the signal adding the signals BP and CP with which the amplitude was adjusted, and supplies it to a switch 79.

[0045] A switch 79 outputs the signal supplied from the differential amplifier 85 to a band pass filter 80, after outputting and writing the MPP signal supplied from the amplifier 75 in a band pass filter 80 before writing it in while writing data in CD-R1 based on the signal supplied from the optical department 13 or. From the signal supplied from the switch 79, a band pass filter 80 removes the component below a predetermined frequency, and the component more than a frequency predetermined [other], and outputs them to an ATIP decoder / record clock generation section 44 as a Wobble signal.

[0046] After the sensors E and F divided into two detect the 1st laser beam for tracking servos reflected from CD-R1 and a detector 71-2 changes it into electrical signals EP and FP, respectively, it is inputted into amplifier 81-1 and 81-2. Amplifier 81-1 and 81-2 amplify Signals EP and FP, respectively, and output them to the side sample hold circuit 83. After the sensors G and H divided into two detect the 2nd laser beam for tracking servos reflected from CD-R1 and a detector 71-3 changes it into electrical signals GP and HP, respectively, it is outputted to amplifier 82-1 and 82-2. Amplifier 82-1 and 82-2 amplify Signals GP and HP, respectively, and output them to the side sample hold circuit 83.

[0047] The side sample hold circuit 83 inputs those signals into amplifier 84 while carrying out sample hold of the signals EP and FP for the 1st tracking servo, and the signals GP and HP for the 2nd tracking servo, respectively until the activity of A/D conversion ends. Before it carries out sample hold of the signals EP and FP for the 1st tracking servo and the signal GP for the 2nd tracking servo, and the HP **, outputs them and writes data in CD-R1, or after writing in the side sample hold circuit 83 while writing data in CD-R1, only a sample performs the signals EP and FP for the 1st tracking servo, and the signals GP and HP for the 2nd tracking servo, and it outputs them to amplifier 84.

[0048] From the inputted signals EP, FP, GP, and HP, according to a degree type (4), amplifier 84 calculates a SPP (Side Push Pull) signal, and outputs it to - input terminal of the differential amplifier 85.

[0049]

$$SPP = (FP + HP) - (EP + GP) \dots (4)$$

The differential amplifier 85 calculates TE signal from the inputted MPP signal and a SPP signal according to a degree type (5).

[0050]

$$TE = MPP - SPP \dots (5)$$

Next, the CD-R drive equipment concerning this invention explains to CD-R1 the actuation which writes in data with reference to the block diagram of drawing 4 based on the data supplied from the Wobble signal and the CD-ROM encoder / decoder ATAPI interface 18.

[0051] From the MPP signal generated with a detector 71-1, amplifier 72-1 or 72-4, the Maine sample hold circuit 74, and amplifier 75, a band pass filter 80 extracts only a predetermined frequency component, and outputs it to an ATIP decoder / record clock generation section 44 as a Wobble signal.

[0052] As CD-R1 is shown in drawing 5 and drawing 6, PURIGURUBU (guide rail) is beforehand prepared in the transparency layer (it is also called a substrate) formed by the polycarbonate. When writing data in CD-R1 as compared with the time of reading data, CD-R drive equipment irradiates a strong laser beam along with PURIGURUBU, disassembles the organic coloring matter of a recording layer, and makes a pit form in CD-R1 by making a transparency layer deform. PURIGURUBU of CD-R1 has a number of wobbles (wave) defined beforehand to the predetermined die length of PURIGURUBU, as shown in drawing 6. Therefore, the laser beam reflected from PURIGURUBU has vibration of the period corresponding to the wobble of PURIGURUBU.

[0053] The signal corresponding to vibration of the period corresponding to the wobble of PURIGURUBU is extracted as a Wobble signal, namely, the passing speed [as opposed to PURIGURUBU in the period of a Wobble signal] of a laser beam irradiated by PURIGURUBU — in other words, the linear velocity of a pit track is supported.

[0054] Moreover, the frequency modulation of the Wobble signal is carried out, and the phase of the clock signal which synchronized with the signal which restored to it synchronizes with the phase of the record clock at the time of recording data on a pit track.

[0055] As compared with the predetermined threshold which was able to be defined beforehand, the supplied Wobble signal is made binary and the binary-ized circuit 101 of an ATIP decoder / record clock generation section 44 outputs it to the frequency comparator circuit 102. The frequency comparator circuit 102 compares the Wobble signal which was supplied from the binary-ized circuit 101 and which was made binary with the signal supplied from the frequency divider 105, and outputs the signal of the electrical potential difference corresponding to the delta frequency of a Wobble signal and the signal supplied from the frequency divider 105 to a low pass filter 103.

[0056] From the signal supplied from the frequency comparator circuit 102, a low pass filter 103 removes the component more than a predetermined frequency, and supplies the signal to VCO (Voltage Controlled Oscillator)104. VCO104 generates the signal of the frequency corresponding to the electrical potential difference after addition of the signal supplied from the low pass filter 103 and the low pass filter 111, and outputs it to a frequency divider 105, a frequency divider 112, and the EFM encoder 45.

[0057] A frequency divider 105 carries out dividing of the signal supplied from VCO104 to 1/196 (for example, if the signal supplied from VCO104 is 4.3218MHz, set to 22.05kHz), and outputs it to the frequency comparator circuit 102.

[0058] A phase comparator 106 compares the phase of the Wobble signal which was supplied from the binary-ized circuit 101 and which was made binary, and the signal supplied from VCO108, and outputs the signal of the electrical potential difference corresponding to the phase contrast to a low pass filter 107.

[0059] From the signal supplied from the phase comparator 106, a low pass filter 107 removes the component more than a predetermined frequency, and supplies the signal to

VCO108. Moreover, the output of a low pass filter 107 is supplied also to the binary-ized circuit 109, and the signal made binary is outputted to a phase comparator 110.

[0060] A phase comparator 110 compares the phase of the FMDT signal which was supplied from the binary-ized circuit 109 and which was made binary, and the signal supplied from the frequency divider 112, and outputs the signal of the electrical potential difference corresponding to the phase contrast to a low pass filter 111.

[0061] After a low pass filter 111 removes the component more than a predetermined frequency and adds the signal with the output of a low pass filter 103 from the signal supplied from the phase comparator 110, it is supplied to VCO104.

[0062] A frequency divider 112 carries out dividing of the signal supplied from VCO104 to $1/686$, and outputs it to a phase comparator 110.

[0063] It is 196 times the frequency of a Wobble signal, and the clock frequency and phase of a FMDT signal synchronize, and the signal outputted to the EFM encoder 45 serves as a record clock which is 686 times the clock frequency of a FMDT signal from an ATIP decoder / record clock generation section 44.

[0064] When the frequency of a Wobble signal changes, an ATIP decoder / record clock generation section 44 follows the change, the frequency of section is as mentioned above first, and it acts so that a phase may next synchronize with the clock of a FMDT signal, and generates a record clock.

[0065] In addition, what is necessary is just to make $1/98$ and the rate of dividing of a frequency divider 112 into $1/343$ for the rate of dividing of a frequency divider 105, when a twice as many record clock as this is required.

[0066] The EFM encoder 45 divides into 8-bit data the data supplied from the CD-ROM encoder / decoder ATAPI interface 18, and transposes each to 14-bit predetermined data (0 which the replaced data follow becomes less than $[2 / 10]$ or more) (only one zero is not inserted between one and continuous 11 or more 0 does not appear). The EFM encoder 45 generates the signal reversed when 1 appears in the replaced 14-bit data, i.e., an EFM signal, based on the record clock supplied from an ATIP decoder / record clock generation section 44.

[0067] The EFM encoder 45 writes in an EFM signal and outputs it to the adaptation processing section 46. The equalizer 121 of the write-in adaptation processing section 46 generates an EQEFM signal based on the inputted EFM signal.

[0068] Drawing 7 is drawing explaining the pit generated by CD-R1 based on an EQEFM signal and an EQEFM signal. As shown in drawing 7 (B), when the EFM encoder 45 generates the EFM signal with which three 1 continues based on the record clock shown in drawing 7 (A), an equalizer 121 outputs an EQEFM signal only with one short period of a record clock.

[0069] An EFM signal is written in and CD-R1 is made to irradiate the strong laser beam which makes a pit form in the optical department 13 in the laser drive circuit 122 of the adaptation processing section 46 based on the EQEFM signal supplied from the equalizer 121.

[0070] Based on the EQEFM signal shown in drawing 7 (C), as the pit formed in CD-R1 is shown in drawing 7 (D), the die length turns into die length corresponding to an EFM signal. When the laser beam to which the optical department 13 irradiates the pit shown in

drawing 7 (D) scans, the RF signal which RF processing section 43 outputs has the signal level corresponding to the die length of a pit, as shown in drawing 7 (E).

[0071] The playback binary-sized wave reproduced from the RF signal shown in drawing 7 (E) becomes equivalent to what reversed the EFM signal, as shown in drawing 7 (F).

[0072] Since the CD-R drive equipment concerning this invention rotates CD-R1 with a predetermined rotational speed which is a constant angular velocity, from the pit track of a periphery near the rim of CD-R1, linear velocity differs and the pit track of the inner circumference near the core of CD-R1 differs in the frequency of the record clock based on a Wobble signal.

[0073] Then, as shown in drawing 8, the EQEFM signals generated from the same EFM signal differ by the case where data are written in the pit track of the inner circumference near the core of CD-R1, and the case where data are written in the pit track of the periphery near the rim of CD-R1.

[0074] For example, an EQEFM signal is set to the period $(N-1)$ of a record clock, and 1 when writing data in the pit track of the inner circumference near the core of CD-R1 based on N period of a record clock, and the EFM signal which is 1, as shown in drawing 8 (A).

[0075] An EQEFM signal is set to the period $(N-X)$ of a record clock, and 1 when writing data in the pit track of the periphery near the rim of CD-R1 based on N period of a record clock, and the EFM signal which is 1. X is or more 0 one or less one of values, and calls processing of the decision of the value of X a light strategy (Write Strategy).

[0076] As shown in drawing 9, processing of a light strategy may divide the pit track nearest to a rim into a predetermined number of M zones (field) from the pit track nearest to the core of CD-R1, and may determine the value of X beforehand for every zone. The write-in adaptation processing section 46 chooses the value of X memorized beforehand based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, and you may make it generate an EQEFM signal.

[0077] For example, in Z in drawing which is the zone where the pit track nearest to the core of CD-R1 is included (0), X is set to 1, X is set to 0.96 in Z (1) which is the zone located in the periphery side of Z (0), and X is set to 0.92 in Z (2) which is the zone located in the periphery side of Z (1). For example, in Z in drawing which is the zone where the pit track nearest to the rim of CD-R1 is included (M), X is set to 0.80 and X is set to 0.86 in Z (M-1) which is the zone located in the inner circumference side of Z (M).

[0078] Moreover, CPU47 chooses the value of X memorized beforehand based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 is supplied, and you may make it the write-in adaptation processing section 46 generate an EQEFM signal based on the value of supplied X for example.

[0079] Furthermore, in order to reduce a jitter, you may make it change the output of the laser diode of the optical department 13 when writing data in CD-R1 for every M zones.

[0080] For example, it sets to Z in drawing which is the zone where the pit track nearest to the core of CD-R1 is included (0). In Z (1) which is the zone which sets the output of the laser diode of the optical department 13 to 9.0mW, and is located in the periphery side of Z (0) The output of a laser diode is set to 9.4mW, and the output of a laser diode is set

to 9.9mW in Z (2) which is the zone located in the periphery side of Z (1). For example, in Z in drawing which is the zone where the pit truck nearest to the rim of CD-R1 is included (M), the output of the laser diode of the optical department 13 is set to 12.0mW, and the output of a laser diode is set to 11.4mW in Z (M-1) which is the zone located in the inner circumference side of Z (M).

[0081] Since the rotational speed of CD-R1 is being fixed, if the location of the optical department 13 to radial [of CD-R1] is acquired from a thread servo, CD-R drive equipment can compute the linear velocity of a pit truck. Based on the location of the optical department 13 to radial [of CD-R1], CD-R drive equipment may perform processing of a light strategy, and may opt for the output of the laser diode of the optical department 13.

[0082] Drawing 10 is drawing explaining the requirements for a configuration of the optical department 13 of CD-R drive equipment. For example, the laser diode of the optical department 13 sets the maximum output to 13 thru/or 14mW, and the objective lens as which a laser beam is completed sets numerical aperture (Numerical Aperture) to 0.5. Moreover, the optical department 13 uses a high-speed detector 71-1 thru/or 71-3 [high-speed], and uses a high-speed photodiode for the monitor of the output of a laser diode. It is building a high-speed current switch in the laser drive circuit 122 etc.

[0083] Next, processing of the writing of CD-R drive equipment is explained with reference to the flow chart of drawing 11 . In step S11, based on the signal supplied from the detector 71-1 of the optical department 13 thru/or 71-3, RF processing section 43 generates a Wobble signal, and outputs it to an ATIP decoder / record clock generation section 44. In step S12, an ATIP decoder / record clock generation section 44 generates the record clock of a predetermined frequency corresponding to the frequency of a Wobble signal based on the Wobble signal supplied from RF processing section 43, and supplies it to it at the EFM encoder 45 and the write-in adaptation processing section 46. [0084] In step S13, the EFM encoder 45 inputs data through a CD-ROM encoder / decoder ATAPI interface 18. In step S14, the EFM encoder 45 generates the EFM signal corresponding to the inputted data based on a record clock, and outputs it to the write-in adaptation processing section 46. In step S15, based on the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 performs processing of a light strategy, and generates an EQEFM signal from an EFM signal.

[0085] In step S16, the write-in adaptation processing section 46 sets up the write-in optical output of the laser diode of the optical department 13 based on the record clock supplied from an ATIP decoder / record clock generation section 44. In step S17, the optical department 13 performs the writing of the data to CD-R1 based on the EQEFM signal supplied write-in adaptation processing section 46.

[0086] As mentioned above, the CD-R drive equipment concerning this invention can rotate CD-R1 with a predetermined rotational speed which is a constant angular velocity, and can write data in CD-R1. Since CD-R drive equipment writes in data, without changing the rotational speed of CD-R1, the time amount of it which waits for change of the rate of rotation of CD-R1 by the constant linear velocity as compared with the case where data are written in is lost, and it can write in data quickly.

[0087] Moreover, since a spindle motor 41 rotates at a fixed rate, the CAV controller 42 can consist of simple circuits as compared with the ATIP decoder 16 of conventional CD-R drive equipment. Since the output of a spindle motor 41 can also be lessened, the calorific value of a spindle motor 41 also decreases, and power consumption can also be lessened.

[0088] Although explained above as CD-R drive equipment, CD-RW (Compact Disc- ReWritable) drive equipment may be used.

[0089] Although a series of processings mentioned above can also be performed by hardware, they can also be performed with software. When performing a series of processings with software, the program which constitutes the software is installed in a general-purpose personal computer etc. from a record medium possible [performing various kinds of functions] by installing the computer built into the hardware of dedication, or various kinds of programs.

[0090] As shown in drawing 12, this record medium is distributed apart from a computer in order to provide a user with a program. The magnetic disk 351 (a floppy disk is included) with which the program is recorded, an optical disk 352 (CD-ROM (Compact Disc-Read Only Memory) ---) DVD (Digital Versatile Disc) is included. It is not only constituted by the package media which consist of a magneto-optic disk 353 (MD (Mini-Disc) is included) or semiconductor memory 354, but it consists of ROM302 with which a user is provided in the condition of having been beforehand included in the computer and on which the program is recorded, a hard disk contained in the storage section 308.

[0091] In addition, in this specification, even if the processing serially performed in accordance with the sequence that the step which describes the program stored in a record medium was indicated is not of course necessarily processed serially, it is a juxtaposition thing also including the processing performed according to an individual.

[0092] Moreover, in this specification, a system expresses the whole equipment constituted by two or more equipments.

[0093]

[Effect of the Invention] Since according to the disk driving gear according to claim 1, the disk drive approach according to claim 5, and the record medium according to claim 6 the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded is generated, the clock corresponding to a linear-velocity signal is generated and data were recorded on the information record medium based on the clock, it comes to be able to do record quickly.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to a record medium at the disk driving gear which can do record for a disk driving gear and an approach, and a list quickly especially about a record medium and an approach, and a list.

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PRIOR ART

[Description of the Prior Art] CD-R (Compact Disc-Recordable) drive equipment records predetermined data on CD-R with which it was equipped, or reproduces predetermined data from CD-R. At this time, CD-R drive equipment applies a spindle servo so that CD-R may be rotated with the rotational speed which becomes fixed [the linear velocity of a predetermined pit track]. Moreover, a tracking servo, a focus servo, and a thread servo are applied so that the laser spot of the laser beam which the laser diode built in an optical pickup generates may follow the predetermined pit track of CD-R and can record or reproduce data.

[0003] The configuration of conventional CD-R drive equipment is explained with reference to the block diagram shown in drawing 1 . The spindle rotated with a spindle motor 11 with the rotational speed which becomes fixed [the linear velocity of a predetermined pit track] is equipped with CD-R1. The spindle driver 12 drives a spindle motor 11 so that it may become the rotational speed [be / fixed] based on the CLV (Constant Linear Velocity) signal supplied from the ATIP decoder 10 about the linear velocity of a predetermined pit track.

[0004] The optical department 13 irradiates light from the laser diode (not shown) to build in in the signal side of CD-R1. The existence and the guide rail (it is also called PURIGURUBU or the guide groove) of a signal (pit) become irregular, and the light reflected from the signal side of CD-R1 is received with the detector of the optical department 13. The detector of the optical department 13 changes the light from CD-R1

into an electrical signal, and outputs it to RF (Radio Frequency) processing section 15.

[0005] The optical department 13 changes the output of a laser diode again based on the data which were supplied from the write-in adaptation processing section 21 and by which the EQFEM modulation was carried out, when writing data in CD-R1. The optical department 13 is driven to radial [of CD-R1] by the thread motor which is not illustrated.

[0006] The APC (Auto Power Control) section 14 adjusts the output of the laser diode of the optical department 13 based on control of CPU (Central Processing Unit)19.

[0007] From the signal detected with the detector, RF processing section 15 generates the regenerative signal (a RF signal is called hereafter) corresponding to a pit, and outputs it to the EFM (Eight to Fourteen Modulation) decoder 17. From the signal detected with the detector, RF processing section 15 generates the Wobble signal corresponding to a guide rail, and outputs it to the ATIP decoder 16. Since the linear velocity of a pit track is fixed, a Wobble signal has a 22.05kHz*1kHz frequency, while recording data on CD-R1, or when having read data in CD-R1.

[0008] Moreover, the frequency modulation of the Wobble signal is carried out, and since the linear velocity of a pit track is fixed, the clock frequency of the signal which restored to it has the fixed frequency of 6.30kHz, while recording data on CD-R1, or when having read data in CD-R1.

[0009] RF processing section 15 performs addition-and-subtraction processing of the signal detected with the detector again, generates a tracking error signal (TE (Tracking Error) signal is called hereafter) and a focal error signal (FE (Focus Error) signal is called hereafter), and outputs them to the servo driver which controls a tracking servo, a focus servo, and a thread servo and which is not illustrated.

[0010] The ATIP decoder 16 outputs the data in which rotation of a spindle is shown to a CD-ROM (Compact Disc-Read Only Memory) encoder / decoder ATAPI (AT Attachment Packet Interface) interface 18 while the optical department 13 generates the CLV signal which shows the linear velocity of the pit track which is irradiating light and supplies it to the spindle driver 12 based on the Wobble signal supplied from RF processing section 15.

[0011] The EFM decoder 17 carries out the EFM recovery of the RF signal generated in RF processing section 15, changes it into the format for CD-ROM, and is outputted to a CD-ROM encoder / decoder ATAPI interface 18.

[0012] A CD-ROM encoder / decoder ATAPI interface 18 supplies the data supplied from the external device to the EFM encoder 20 while outputting the data supplied from the ATIP decoder 16 or the EFM decoder 17 through an ATAPI interface to the radical of control of CPU19 at an external device.

[0013] CPU19 controls a CD-ROM encoder / decoder ATAPI interface 18, the write-in adaptation processing section 21, and the APC section 14 based on the data inputted from the CD-ROM encoder / decoder ATAPI interface 18.

[0014] The EFM encoder 20 generates the EFM signal corresponding to the data inputted from the CD-ROM encoder / decoder ATAPI interface 18, and outputs it to the write-in adaptation processing section 21 with the record clock of the frequency of immobilization.

[0015] Based on the EFM signal and record clock which were supplied from the EFM encoder 20, the write-in adaptation processing section 21 generates an EQEFM (Equalized EFM) signal, and supplies it to the optical department 13.

[0016] Thus, conventional CD-R drive equipment applies a spindle servo so that data may be rotated with the rotational speed from which the linear velocity of the pit track which is carrying out record or read-out becomes fixed.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since according to the disk driving gear according to claim 1, the disk drive approach according to claim 5, and the record medium according to claim 6 the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded is generated, the clock corresponding to a linear-velocity signal is generated and data were recorded on the information record medium based on the clock, it comes to be able to do record quickly.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, conventional CD-R drive equipment must wait for the engine speed of CD-R1 to change, and requires time amount for record of the data to CD-R1 until the linear velocity of a pit truck to record becomes fixed.

[0018] This invention is made in view of such a situation, and it aims at being made to be

possible [record] quickly.

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MEANS

[Means for Solving the Problem] A disk driving gear according to claim 1 is characterized by including a linear-velocity signal generation means to generate the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, a clock generation means to generate the clock corresponding to a linear-velocity signal, and a record means to record data on an information record medium based on a clock.

[0020] A linear-velocity signal is generable from a Wobble signal.

[0021] A record means can establish further a driving signal amendment means to amend the driving signal which drives an optical generating means, based on a clock including the optical generating means which emits the light which records data to an information record medium.

[0022] A disk driving gear can prepare further the adjustment device which adjusts the reinforcement of the laser beam which records data to the information record medium of a record means based on a clock.

[0023] The disk drive approach according to claim 5 is characterized by including the linear-velocity signal generation step which generates the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, the clock generation step which generates the clock corresponding to a linear-velocity signal, and the record step which records data on an information record medium based on a clock.

[0024] A record medium according to claim 6 is characterized by to be recorded the program which the computer which performs processing containing the linear-velocity signal generation step which generates the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded, the clock-generation step which generate the clock corresponding to a linear-velocity signal, and the record control step which control record of the data to an information record medium based on a clock can read.

[0025] In a disk driving gear according to claim 1, the disk drive approach according to

claim 5, and a record medium according to claim 6, the linear-velocity signal corresponding to the linear velocity of the truck with which the data of the information record medium with which it is equipped are recorded is generated, the clock corresponding to a linear-velocity signal is generated, and data are recorded on an information record medium based on a clock.

[0026]

[Embodiment of the Invention] Drawing 2 is the block diagram showing the configuration of the gestalt of 1 operation of the CD-R drive equipment concerning this invention. The same sign is given to the conventional case and the corresponding part, and the explanation is omitted suitably. A spindle motor 41 rotates a spindle with a predetermined rotational speed which is a constant angular velocity. CD-R1 with which the spindle is equipped rotates with a predetermined rotational speed which is a constant angular velocity. A spindle motor 41 outputs the electrical potential difference proportional to the rotational speed of a spindle to the CAV (Constant Angular Velocity) controller 42 as a FG (Frequency Generator) signal.

[0027] Based on FG signal supplied from the spindle motor 41, the CAV controller 42 controls the spindle driver 12 so that a spindle motor 41 rotates with a predetermined rotational speed which is a constant angular velocity.

[0028] From the signal detected with the detector, RF processing section 43 generates the Wobble signal corresponding to a guide rail, and outputs it to an ATIP decoder / record clock generation section 44 while it generates RF ** corresponding to a pit and outputs it to the EFM decoder 17 from the signal detected with the detector. The frequency and a recovery frequency change with the locations of the pit truck with which it recorded or read and the optical department 13 is carrying out the Wobble signal which RF processing section 43 of the CD-R drive equipment concerning this invention outputs to an ATIP decoder / record clock generation section 44 since the angular velocity of CD-R1 is fixed.

[0029] An ATIP decoder / record clock generation section 44 outputs the data in which rotation of a spindle is shown to a CD-ROM encoder / decoder ATAPI interface 18 while it generates the record clock of the predetermined frequency corresponding to the frequency and recovery frequency of a Wobble signal based on the Wobble signal supplied from RF processing section 43 and supplies it to the EFM encoder 45, the write-in adaptation processing section 46, and CPU47.

[0030] From the data inputted from the CD-ROM encoder / decoder ATAPI interface 18, the EFM encoder 45 generates an EFM signal based on the record clock supplied from an ATIP decoder / record clock generation section 44, and outputs it to it at the write-in adaptation processing section 46.

[0031] Based on the EFM signal supplied from the EFM encoder 45, and the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 generates an EQEFM signal, and supplies it to the optical department 13. The write-in adaptation processing section 46 controls the reinforcement of the laser beam to which the optical department 13 irradiates CD-R1 based on the data supplied from CPU47.

[0032] CPU47 generates data for the write-in adaptation processing section 46 to control

the reinforcement of the laser beam of the optical department 13 based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, and outputs them to the write-in adaptation processing section 46.

[0033] When recording data on CD-R1, the optical department 13 changes the reinforcement of a laser beam based on the EQEFM signal supplied from the write-in adaptation processing section 46.

[0034] Drawing 3 is drawing showing the configuration of the detector of the optical department 13, and RF signal-processing section 43. The optical department 13 irradiates the laser beam by which outgoing radiation was carried out from the laser diode to build in in the signal side of CD-R1. One laser beam irradiated is divided into one laser beam for signal reading (record), and two laser beams for tracking servos by the grating (diffraction grating) which is not illustrated at this time. That is, one laser beam is divided into three laser beams by the grating. And three laser beams from the reflector acquired by irradiating three laser beams in the signal side of CD-R1 are received by the detector 71-1 thru/or 71-3, respectively.

[0035] After the quadrisected sensors A and D detect a detector 71-1 and it carries out ***** conversion at electrical signals AP, BP, CP, and DP, it outputs the laser beam for signal reading reflected from CD-R1 to amplifier 72-1 thru/or 72-4. Amplifier 72-1 thru/or 72-4 amplify Signals AP and DP, respectively, and outputs them to an adder 73.

[0036] An adder 73 is adding the signals AP, BP, CP, and DP amplified by amplifier 72-1 thru/or 72-4 according to a degree type (1), generates a RF signal and outputs it to the EFM decoder 17.

[0037]

$$RF = (AP + BP + CP + DP) \dots (1)$$

Amplifier 72-1 thru/or 72-4 output Signals AP, BP, CP, and DP to the Maine sample hold circuit 74 again, respectively.

[0038] The Maine sample hold circuit 74 outputs those signals to amplifier 75 while carrying out sample hold of the signals AP, BP, CP, and DP until the activity of predetermined A/D (Analog To Digital) conversion ends. Before it carries out sample hold of the signals AP, BP, CP, and DP, outputs them and writes data in CD-R1, or after writing in the Maine sample hold circuit 74 while writing data in CD-R1, only a sample performs Signals AP, BP, CP, and DP (** which is not held), and it outputs them to amplifier 75.

[0039] Amplifier 75 outputs the signal which added the inputted signals BP and CP, and added and generated them to AGC circuit 77 while outputting the signal which added the inputted signals AP and DP, and added and generated them to the AGC (Automatic Gain Control) circuit 76.

[0040] Amplifier 75 calculates the inputted signals AP, BP, CP, and DP again according to a degree type (2), and generates FE signal.

[0041]

$$FE = (AP + CP) - (BP + DP) \dots (2)$$

Further, from the inputted signals AP, BP, CP, and DP, according to a degree type (3), amplifier 75 calculates an MPP (Main Push Pull) signal, and outputs it to a switch 79 and + input terminal of the differential amplifier 85.

[0042]

$$MPP = (AP + DP) - (BP + CP) \dots (3)$$

AGC circuit 76 adjusts the amplitude so that the level of the signal adding the inputted signals AP and DP may be set to the same level as reference level as compared with predetermined reference level, and it outputs it to + input terminal of the differential amplifier 78.

[0043] AGC circuit 77 adjusts the amplitude so that the level of the signal adding the inputted signals BP and CP may be set to the same level as reference level as compared with predetermined reference level, and it outputs it to - input terminal of the differential amplifier 78.

[0044] The differential amplifier 78 computes the difference of the signal adding the signals AP and DP with which the amplitude was adjusted, and the signal adding the signals BP and CP with which the amplitude was adjusted, and supplies it to a switch 79.

[0045] A switch 79 outputs the signal supplied from the differential amplifier 78 to a band pass filter 80, after outputting and writing the MPP signal supplied from the amplifier 75 in a band pass filter 80 before writing it in while writing data in CD-R1 based on the signal supplied from the optical department 13 or. From the signal supplied from the switch 79, a band pass filter 80 removes the component below a predetermined frequency, and the component more than a frequency predetermined [other], and outputs them to an ATIP decoder / record clock generation section 44 as a Wobble signal.

[0046] After the sensors E and F divided into two detect the 1st laser beam for tracking servos reflected from CD-R1 and a detector 71-2 changes it into electrical signals EP and FP, respectively, it is inputted into amplifier 81-1 and 81-2. Amplifier 81-1 and 81-2 amplify Signals EP and FP, respectively, and output them to the side sample hold circuit 83. After the sensors G and H divided into two detect the 2nd laser beam for tracking servos reflected from CD-R1 and a detector 71-3 changes it into electrical signals GP and HP, respectively, it is outputted to amplifier 82-1 and 82-2. Amplifier 82-1 and 82-2 amplify Signals GP and HP, respectively, and output them to the side sample hold circuit 83.

[0047] The side sample hold circuit 83 inputs those signals into amplifier 84 while carrying out sample hold of the signals EP and FP for the 1st tracking servo, and the signals GP and HP for the 2nd tracking servo, respectively until the activity of A/D conversion ends. Before it carries out sample hold of the signals EP and FP for the 1st tracking servo and the signal GP for the 2nd tracking servo, and the HP **, outputs them and writes data in CD-R1, or after writing in the side sample hold circuit 83 while writing data in CD-R1, only a sample performs the signals EP and FP for the 1st tracking servo, and the signals GP and HP for the 2nd tracking servo, and it outputs them to amplifier 84.

[0048] From the inputted signals EP, FP, GP, and HP, according to a degree type (4), amplifier 84 calculates a SPP (Side Push Pull) signal, and outputs it to - input terminal of the differential amplifier 85.

[0049]

$$SPP = (FP + HP) - (EP + GP) \dots (4)$$

The differential amplifier 85 calculates TE signal from the inputted MPP signal and a SPP signal according to a degree type (5).

[0050]

TE=MPP-SPP ... (5)

Next, the CD-R drive equipment concerning this invention explains to CD-R1 the actuation which writes in data with reference to the block diagram of drawing 4 based on the data supplied from the Wobble signal and the CD-ROM encoder / decoder ATAPI interface 18.

[0051] From the MPP signal generated with a detector 71-1, amplifier 72-1 or 72-4, the Maine sample hold circuit 74, and amplifier 75, a band pass filter 80 extracts only a predetermined frequency component, and outputs it to an ATIP decoder / record clock generation section 44 as a Wobble signal.

[0052] As CD-R1 is shown in drawing 5 and drawing 6, PURIGURUBU (guide rail) is beforehand prepared in the transparency layer (it is also called a substrate) formed by the polycarbonate. When writing data in CD-R1 as compared with the time of reading data, CD-R drive equipment irradiates a strong laser beam along with PURIGURUBU, disassembles the organic coloring matter of a recording layer, and makes a pit form in CD-R1 by making a transparency layer deform. PURIGURUBU of CD-R1 has a number of wobbles (wave) defined beforehand to the predetermined die length of PURIGURUBU, as shown in drawing 6. Therefore, the laser beam reflected from PURIGURUBU has vibration of the period corresponding to the wobble of PURIGURUBU.

[0053] The signal corresponding to vibration of the period corresponding to the wobble of PURIGURUBU is extracted as a Wobble signal, namely, the passing speed [as opposed to PURIGURUBU in the period of a Wobble signal] of a laser beam irradiated by PURIGURUBU — in other words, the linear velocity of a pit truck is supported.

[0054] Moreover, the frequency modulation of the Wobble signal is carried out, and the phase of the clock signal which synchronized with the signal which restored to it synchronizes with the phase of the record clock at the time of recording data on a pit truck.

[0055] As compared with the predetermined threshold which was able to be defined beforehand, the supplied Wobble signal is made binary and the binary-ized circuit 101 of an ATIP decoder / record clock generation section 44 outputs it to the frequency comparator circuit 102. The frequency comparator circuit 102 compares the Wobble signal which was supplied from the binary-ized circuit 101 and which was made binary with the signal supplied from the frequency divider 105, and outputs the signal of the electrical potential difference corresponding to the delta frequency of a Wobble signal and the signal supplied from the frequency divider 105 to a low pass filter 103.

[0056] From the signal supplied from the frequency comparator circuit 102, a low pass filter 103 removes the component more than a predetermined frequency, and supplies the signal to VCO (Voltage Controlled Oscillator)104. VCO104 generates the signal of the frequency corresponding to the electrical potential difference after addition of the signal supplied from the low pass filter 103 and the low pass filter 111, and outputs it to a frequency divider 105, a frequency divider 112, and the EFM encoder 45.

[0057] A frequency divider 105 carries out dividing of the signal supplied from VCO104 to 1/196 (for example, if the signal supplied from VCO104 is 4.3218MHz, set to 22.05kHz), and outputs it to the frequency comparator circuit 102.

[0058] A phase comparator 106 compares the phase of the Wobble signal which was supplied from the binary-ized circuit 101 and which was made binary, and the signal supplied from VCO108, and outputs the signal of the electrical potential difference corresponding to the phase contrast to a low pass filter 107.

[0059] From the signal supplied from the phase comparator 106, a low pass filter 107 removes the component more than a predetermined frequency, and supplies the signal to VCO108. Moreover, the output of a low pass filter 107 is supplied also to the binary-ized circuit 109, and the signal made binary is outputted to a phase comparator 110.

[0060] A phase comparator 110 compares the phase of the FMDT signal which was supplied from the binary-ized circuit 109 and which was made binary, and the signal supplied from the frequency divider 112, and outputs the signal of the electrical potential difference corresponding to the phase contrast to a low pass filter 111.

[0061] After a low pass filter 111 removes the component more than a predetermined frequency and adds the signal with the output of a low pass filter 103 from the signal supplied from the phase comparator 110, it is supplied to VCO104.

[0062] A frequency divider 112 carries out dividing of the signal supplied from VCO104 to $1/686$, and outputs it to a phase comparator 110.

[0063] It is 196 times the frequency of a Wobble signal, and the clock frequency and phase of a FMDT signal synchronize, and the signal outputted to the EFM encoder 45 serves as a record clock which is 686 times the clock frequency of a FMDT signal from an ATIP decoder / record clock generation section 44.

[0064] When the frequency of a Wobble signal changes, an ATIP decoder / record clock generation section 44 follows the change, the frequency of section is as mentioned above first, and it acts so that a phase may next synchronize with the clock of a FMDT signal, and generates a record clock.

[0065] In addition, what is necessary is just to make $1/98$ and the rate of dividing of a frequency divider 112 into $1/343$ for the rate of dividing of a frequency divider 105, when a twice as many record clock as this is required.

[0066] The EFM encoder 45 divides into 8-bit data the data supplied from the CD-ROM encoder / decoder ATAPI interface 18, and transposes each to 14-bit predetermined data (0 which the replaced data follow becomes less than $[2/10]$ or more) (only one zero is not inserted between one and continuous 11 or more 0 does not appear). The EFM encoder 45 generates the signal reversed when 1 appears in the replaced 14-bit data, i.e., an EFM signal, based on the record clock supplied from an ATIP decoder / record clock generation section 44.

[0067] The EFM encoder 45 writes in an EFM signal and outputs it to the adaptation processing section 46. The equalizer 121 of the write-in adaptation processing section 46 generates an EQEFM signal based on the inputted EFM signal.

[0068] Drawing 7 is drawing explaining the pit generated by CD-R1 based on an EQEFM signal and an EQEFM signal. As shown in drawing 7 (B), when the EFM encoder 45 generates the EFM signal with which three 1 continues based on the record clock shown in drawing 7 (A), an equalizer 121 outputs an EQEFM signal only with one short period of a record clock.

[0069] An EFM signal is written in and CD-R1 is made to irradiate the strong laser beam

which makes a pit form in the optical department 13 in the laser drive circuit 122 of the adaptation processing section 46 based on the EQEFM signal supplied from the equalizer 121.

[0070] Based on the EQEFM signal shown in drawing 7 (C), as the pit formed in CD-R1 is shown in drawing 7 (D), the die length turns into die length corresponding to an EFM signal. When the laser beam to which the optical department 13 irradiates the pit shown in drawing 7 (D) scans, the RF signal which RF processing section 43 outputs has the signal level corresponding to the die length of a pit, as shown in drawing 7 (E).

[0071] The playback binary-sized wave reproduced from the RF signal shown in drawing 7 (E) becomes equivalent to what reversed the EFM signal, as shown in drawing 7 (F).

[0072] Since the CD-R drive equipment concerning this invention rotates CD-R1 with a predetermined rotational speed which is a constant angular velocity, from the pit truck of a periphery near the rim of CD-R1, linear velocity differs and the pit truck of the inner circumference near the core of CD-R1 differs in the frequency of the record clock based on a Wobble signal.

[0073] Then, as shown in drawing 8, the EQEFM signals generated from the same EFM signal differ by the case where data are written in the pit truck of the inner circumference near the core of CD-R1, and the case where data are written in the pit truck of the periphery near the rim of CD-R1.

[0074] For example, an EQEFM signal is set to the period (N-1) of a record clock, and 1 when writing data in the pit truck of the inner circumference near the core of CD-R1 based on N period of a record clock, and the EFM signal which is 1, as shown in drawing 8 (A).

[0075] An EQEFM signal is set to the period (N-X) of a record clock, and 1 when writing data in the pit truck of the periphery near the rim of CD-R1 based on N period of a record clock, and the EFM signal which is 1. X is or more 0 one or less one of values, and calls processing of the decision of the value of X a light strategy (Write Strategy).

[0076] As shown in drawing 9, processing of a light strategy may divide the pit truck nearest to a rim into a predetermined number of M zones (field) from the pit truck nearest to the core of CD-R1, and may determine the value of X beforehand for every zone. The write-in adaptation processing section 46 chooses the value of X memorized beforehand based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, and you may make it generate an EQEFM signal.

[0077] For example, in Z in drawing which is the zone where the pit truck nearest to the core of CD-R1 is included (0), X is set to 1, X is set to 0.96 in Z (1) which is the zone located in the periphery side of Z (0), and X is set to 0.92 in Z (2) which is the zone located in the periphery side of Z (1). For example, in Z in drawing which is the zone where the pit truck nearest to the rim of CD-R1 is included (M), X is set to 0.80 and X is set to 0.86 in Z (M-1) which is the zone located in the inner circumference side of Z (M).

[0078] Moreover, CPU47 chooses the value of X memorized beforehand based on the frequency of the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 is supplied, and you may make it the write-in adaptation processing section 46 generate an EQEFM signal based on the value of supplied X for example.

[0079] Furthermore, in order to reduce a jitter, you may make it change the output of the laser diode of the optical department 13 when writing data in CD-R1 for every M zones.

[0080] For example, it sets to Z in drawing which is the zone where the pit truck nearest to the core of CD-R1 is included (0). In Z (1) which is the zone which sets the output of the laser diode of the optical department 13 to 9.0mW, and is located in the periphery side of Z (0) The output of a laser diode is set to 9.4mW, and the output of a laser diode is set to 9.9mW in Z (2) which is the zone located in the periphery side of Z (1). For example, in Z in drawing which is the zone where the pit truck nearest to the rim of CD-R1 is included (M), the output of the laser diode of the optical department 13 is set to 12.0mW, and the output of a laser diode is set to 11.4mW in Z (M-1) which is the zone located in the inner circumference side of Z (M).

[0081] Since the rotational speed of CD-R1 is being fixed, if the location of the optical department 13 to radial [of CD-R1] is acquired from a thread servo, CD-R drive equipment can compute the linear velocity of a pit truck. Based on the location of the optical department 13 to radial [of CD-R1], CD-R drive equipment may perform processing of a light strategy, and may opt for the output of the laser diode of the optical department 13.

[0082] Drawing 10 is drawing explaining the requirements for a configuration of the optical department 13 of CD-R drive equipment. For example, the laser diode of the optical department 13 sets the maximum output to 13 thru/or 14mW, and the objective lens as which a laser beam is completed sets numerical aperture (Numerical Aperture) to 0.5. Moreover, the optical department 13 uses a high-speed detector 71-1 thru/or 71-3 [high-speed], and uses a high-speed photodiode for the monitor of the output of a laser diode. It is building a high-speed current switch in the laser drive circuit 122 etc.

[0083] Next, processing of the writing of CD-R drive equipment is explained with reference to the flow chart of drawing 11 . In step S11, based on the signal supplied from the detector 71-1 of the optical department 13 thru/or 71-3, RF processing section 43 generates a Wobble signal, and outputs it to an ATIP decoder / record clock generation section 44. In step S12, an ATIP decoder / record clock generation section 44 generates the record clock of a predetermined frequency corresponding to the frequency of a Wobble signal based on the Wobble signal supplied from RF processing section 43, and supplies it to it at the EFM encoder 45 and the write-in adaptation processing section 46.

[0084] In step S13, the EFM encoder 45 inputs data through a CD-ROM encoder / decoder ATAPI interface 18. In step S14, the EFM encoder 45 generates the EFM signal corresponding to the inputted data based on a record clock, and outputs it to the write-in adaptation processing section 46. In step S15, based on the record clock supplied from an ATIP decoder / record clock generation section 44, the write-in adaptation processing section 46 performs processing of a light strategy, and generates an EQEFM signal from an EFM signal.

[0085] In step S16, the write-in adaptation processing section 46 sets up the write-in optical output of the laser diode of the optical department 13 based on the record clock supplied from an ATIP decoder / record clock generation section 44. In step S17, the optical department 13 performs the writing of the data to CD-R1 based on the EQEFM signal supplied write-in adaptation processing section 46.

[0086] As mentioned above, the CD-R drive equipment concerning this invention can rotate CD-R1 with a predetermined rotational speed which is a constant angular velocity, and can write data in CD-R1. Since CD-R drive equipment writes in data, without changing the rotational speed of CD-R1, the time amount of it which waits for change of the rate of rotation of CD-R1 by the constant linear velocity as compared with the case where data are written in is lost, and it can write in data quickly.

[0087] Moreover, since a spindle motor 41 rotates at a fixed rate, the CAV controller 42 can consist of simple circuits as compared with the ATIP decoder 16 of conventional CD-R drive equipment. Since the output of a spindle motor 41 can also be lessened, the calorific value of a spindle motor 41 also decreases, and power consumption can also be lessened.

[0088] Although explained above as CD-R drive equipment, CD-RW (Compact Disc-ReWritable) drive equipment may be used.

[0089] Although a series of processings mentioned above can also be performed by hardware, they can also be performed with software. When performing a series of processings with software, the program which constitutes the software is installed in a general-purpose personal computer etc. from a record medium possible [performing various kinds of functions] by installing the computer built into the hardware of dedication, or various kinds of programs.

[0090] As shown in drawing 12, this record medium is distributed apart from a computer in order to provide a user with a program. The magnetic disk 351 (a floppy disk is included) with which the program is recorded, an optical disk 352 (CD-ROM (Compact Disc-Read Only Memory) ---) DVD (Digital Versatile Disc) is included. It is not only constituted by the package media which consist of a magneto-optic disk 353 (MD (Mini-Disc) is included) or semiconductor memory 354, but It consists of ROM302 with which a user is provided in the condition of having been beforehand included in the computer and on which the program is recorded, a hard disk contained in the storage section 308.

[0091] In addition, in this specification, even if the processing serially performed in accordance with the sequence that the step which describes the program stored in a record medium was indicated is not of course necessarily processed serially, it is a juxtaposition thing also including the processing performed according to an individual.

[0092] Moreover, in this specification, a system expresses the whole equipment constituted by two or more equipments.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2**** shows the word which can not be translated.

3 In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing explaining the configuration of conventional CD-R drive equipment.

[Drawing 2] It is the block diagram showing the configuration of the gestalt of 1 operation of the CD-R drive equipment concerning this invention.

[Drawing 3] It is drawing showing the configuration of the detector of the optical department 13, and RF signal-processing section 43.

[Drawing 4] It is a block diagram explaining the actuation which writes in the data of the CD-R drive equipment concerning this invention.

[Drawing 5] It is drawing explaining the structure of CD-R1.

[Drawing 6] It is drawing explaining the structure of CD-R1.

[Drawing 7] It is drawing explaining the pit generated by CD-R1 based on an EQEFM signal and an EQEFM signal.

[Drawing 8] It is drawing explaining a light strategy.

[Drawing 9] It is drawing explaining adjustment of the light strategy for every zone, and the output of a laser diode.

[Drawing 10] It is drawing explaining the requirements for a configuration of the optical department 13 of CD-R drive equipment.

[Drawing 11] It is a flow chart explaining processing of the writing of CD-R drive equipment.

[Drawing 12] It is drawing explaining a record medium.

[Description of Notations]

41 Spindle Motor 42 CAV Controller 43 RF Processing Section, 44 ATIP Decoder / Record Clock Generation Section 45 EFM Encoder 46 Write-in Adaptation Processing Section 47 CPU, 101 Binary-ized circuit 102 A frequency comparator circuit, 103 Low pass filter 104 VCO 105 Frequency divider 106 At least is a phase comparator circuit. 107 A low pass filter, 108 VCO 109 A binary-ized circuit, 110 Phase comparator circuit 111 Low pass filter 112 Frequency divider 121 Equalizer 122 Laser drive circuit 301 CPU 302 ROM 303 RAM, 308 Storage section 351 A magnetic disk and 352 Optical disk 353 Magneto-optic disk 354 Semiconductor memory

[Translation done.]

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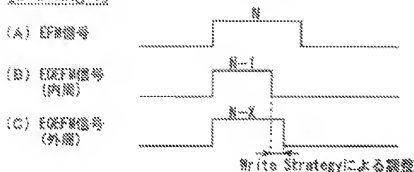
1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. *** shows the word which can not be translated.

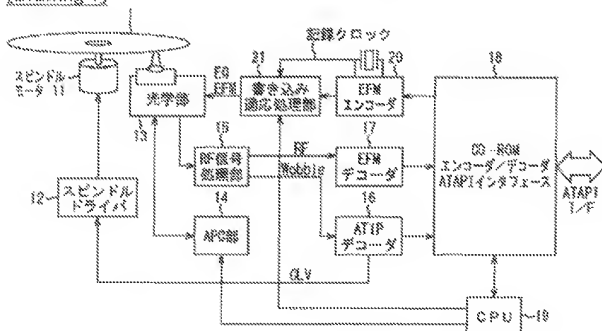
3. In the drawings, any words are not translated.

DRAWINGS

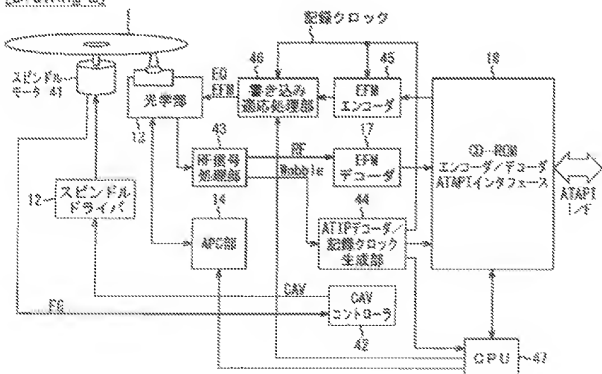
[Drawing 8]



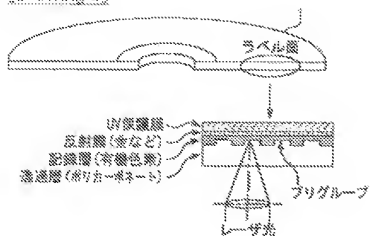
[Drawing 1]



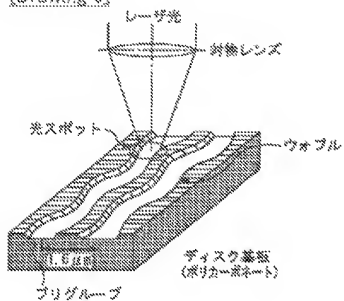
[Drawing 2]



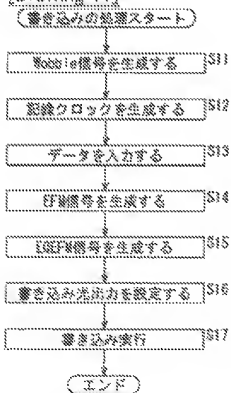
[Drawing 5]



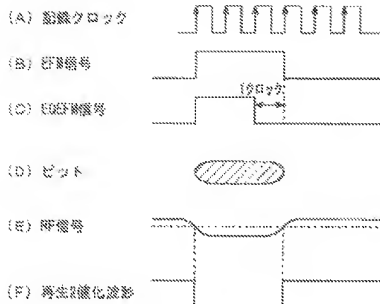
[Drawing 6]



[Drawing 11]



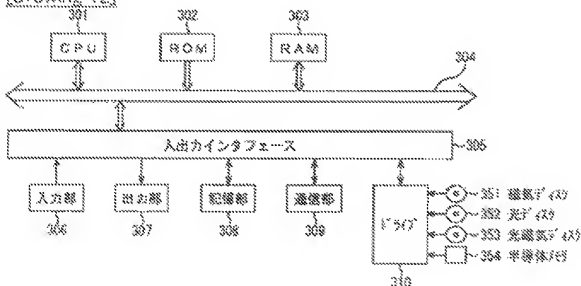
[Drawing 3]



[Drawing 10]

項目	説明	理由
・ハイパワーレーザ光源	対物レンズ射出径大13~14mm (ただし終端記録時)	高速度CD-Rディスク(1.2m/s、1.4m/s)の高速記録に対応する。
・高NA対物レンズ	NA=0.5	記録後のディスクの高品質化(部ラック化)のために、ビーム形状を絞る。
DPP方式によるトラッキングエラー検出	TE=MPF-DPP (A+D)-(B+C)-(F+E)-(G+H)	内周側トラッキングの影響があるため、記録中のサーボ信号生成には1ビームPush-pull法もしくはDPP法しか選択されない。
・高速セトリング8分割DTG内蔵	Read Sampling方式DPPサーボに对应Main-slaveビームでトランスインピーダンスを最適化	記録中のサーボ信号生成の方法としてサンプルホールド方式を用いているので、ディテクター信号の高速セトリングが必要となる。特に微小なWrite信号の抽出には高速化が不可欠。
・高速LEDモニタPD内蔵	WriteAssist用サンプルホールド型APCに对应	記録中のRead/Write Power制御に用いる。これもサンプルホールド方式を用いているので、高速モニタが必要となる。
・高速電流スイッチ内蔵	Read/Write OverDriveパワー用電流スイッチをLDdriverに内蔵	オーレンジバックの各種ライストラセージ(擦除/記録)に対応。
・高周波電源回路内蔵	高速スイッチング回路をLDdriverに内蔵	ハイパワーレーザのモードホッピング制御の低減のため、ただし完全スイッチングのため、発熱周波数は低い。(100kHz~200kHz)

[Drawing 12]



[Translation done]

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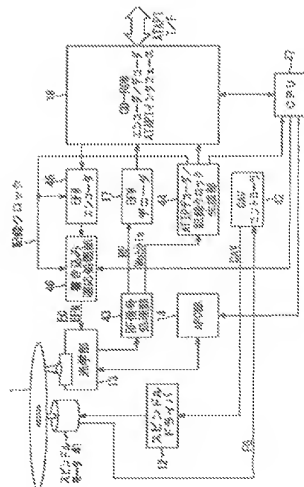
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(54) 【発明の名称】 ディスク駆動装置および方法、並びに記録媒体

(57) 【要約】

【課題】 迅速に記録する。

【解決手段】 信号処理部43は、装着されているCD-R1の、ビットトラックの線速度に対応するWobble信号を生成する。ATIPデコード/記録クロック生成部44は、Wobble信号に対応する記録クロックを生成する。IPXエンコーダ45および書き込み適応処理部46は、記録クロックに基づいて、CD-R1にデータを記録させる。



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【特許請求の範囲】

【請求項1】 装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成手段と、

前記線速度信号に対応するクロックを生成するクロック生成手段と、

前記クロックに基づいて、前記情報記録媒体に前記データを記録する記録手段を含むことを特徴とするディスク駆動装置。

【請求項2】 前記線速度信号は、Wobble信号から生成されることを特徴とする請求項1に記載のディスク駆動装置。

【請求項3】 前記記録手段は、前記情報記録媒体に対して前記データを記録する光を発する光発生手段を含む。

前記クロックに基づいて、前記光発生手段を駆動する駆動信号を補正する駆動信号補正手段を含むことを特徴とする請求項1に記載のディスク駆動装置。

【請求項4】 前記クロックに基づいて、前記記録手段の前記情報記録媒体に対してデータを記録するレーザ光の強度を調整する調整手段を含むことを特徴とする請求項1に記載のディスク駆動装置。

【請求項5】 装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成ステップと、

前記線速度信号に対応するクロックを生成するクロック生成ステップと、

前記クロックに基づいて、前記情報記録媒体に前記データを記録する記録ステップを含むことを特徴とするディスク駆動方法。

【請求項6】 装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成ステップと、

前記線速度信号に対応するクロックを生成するクロック生成ステップと、

前記クロックに基づいて、前記情報記録媒体への前記データの記録を制御する記録制御ステップを含むことを特徴とするコンピュータが読み取り可能なプログラムが記録されている記録媒体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、ディスク駆動装置および方法、並びに記録媒体に関し、特に、迅速に、記録ができるディスク駆動装置および方法、並びに記録媒体に関する。

【0002】

【従来の技術】CD-R (Compact Disc-Recordable) ドライブ装置は、装着されたCD-Rに所定のデータを記録するか、またはCD-Rから所定のデータを再生する。このとき、CD-Rドライブ装置は、CD-Rを、所定のビットトラ

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クの線速度が一定となる回転速度で回転するように、スピンドルサーボをかける。また、光ピックアップに内蔵されるレーザダイオードが発生するレーザ光のレーザポットが、CD-Rの所定のビットトラックを追随し、データを記録または再生できるように、トラッキングサーボ、フォーカスサーボ、およびスレッドサーボがかけられる。

【0003】従来のCD-Rドライブ装置の構成について、図1に示すブロック図を参照して説明する。CD-R1は、スピンドルモータ11により、所定のビットトラックの線速度が一定となる回転速度で回転されるスピンドルに装着される。スピンドルドライブ12は、ATIPデコード16から供給されるCLV (Constant Linear Velocity) 信号を基に、所定のビットトラックの線速度を一定とする回転速度となるように、スピンドルモータ11を駆動する。

【0004】光学部13は、内蔵するレーザダイオード（図示せず）から、CD-R1の信号面に光を照射する。CD-R1の信号面より反射された光は、信号（ビット）の有無および案内溝（プリグルーブまたはガイドグルーブとも称する）により変調されており、光学部13の検出器で受光される。光学部13の検出器は、CD-R1からの光を電気信号に変換し、RF (Radio Frequency) 処理部15に出力する。

【0005】光学部13は、また、データをCD-R1に書き込むとき、書き込み適応処理部21から供給された、EFM変調されたデータを基に、レーザダイオードの出力を変化させる。光学部13は、同様にスレッドモータによりCD-R1の手径方向に駆動される。

【0006】APE (Auto Power Control) 部14は、CPU (Central Processing Unit) 10の制御に基づき、光学部13のレーザダイオードの出力を調整する。

【0007】RF処理部15は、検出器で検出された信号から、ビットに対応する再生信号（以下、RF信号と称する）を生成し、RF (Radio Frequency to Fourteen Modulation) デコーダ17に出力する。RF処理部15は、検出器で検出された信号から、案内溝に対応するWobble信号を生成し、ATIPデコード16に出力する。Wobble信号は、ビットトラックの線速度が一定なので、CD-R1にデータが記録しているとき、またはCD-R1からデータを読み取っているとき、22.05kHz±1kHzの周波数を有する。

【0008】また、Wobble信号は、周波数変調しており、それを復調した信号のクロック周波数はビットトラックの線速度が一定なので、CD-R1にデータを記録しているとき、またはCD-R1からデータを読み取っているとき、6.30kHzの一定の周波数を有する。

【0009】RF処理部15は、また、検出器で検出された信号の加減算処理を行い、トラッキングエラー信号（以下、TE (Tracking Error) 信号と称する）、およびフォーカスエラー信号（以下、FE (Focus Error) 信号

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と称する)を生成し、トラッキングサーボ、フォーカスサーボ、およびスレッドサーボを制御する指示信号サーボドライバに出力する。

【0010】ATIPデコード16は、RF処理部15から供給されたWobble信号を基に、光学部13が光を照射しているビットトラックの線速度を示すCLV信号を生成し、スピンドルドライバ12に供給するとともに、スピンドルの回転を示すデータをCD-ROM (Compact Disc-Read Only Memory) エンコーダ/デコーダATAPI (ATA Attachment Packet Interface) インターフェース18に出力する。

【0011】EFMデコード17は、RF処理部15で生成されたRF信号をEFM復調し、CD-ROM用のフォーマットに変換し、CD-ROMエンコーダ/デコーダATAPIインターフェース18に出力する。

【0012】CD-ROMエンコーダ/デコーダATAPIインターフェース18は、FPU19の制御の基に、ATIPデコード16またはEFMデコード17から供給されたデータを、ATAPIインターフェースを介して、外部の機器に出力するとともに、外部の機器から供給されたデータをEFMエンコード20に供給する。

【0013】FPU19は、CD-ROMエンコーダ/デコーダATAPIインターフェース18から入力されたデータを基に、CD-ROMエンコーダ/デコーダATAPIインターフェース18、書き込み適応処理部21、およびAPC部14を制御する。

【0014】EFMエンコード20は、CD-ROMエンコーダ/デコーダATAPIインターフェース18から入力されたデータに対応するEFM信号を生成し、固定の周波数の記録クロックとともに、書き込み適応処理部21に出力する。

【0015】書き込み適応処理部21は、EFMエンコード20から供給された、EFM信号および記録クロックを基に、EGFM (Equalized EFM) 信号を生成して、光学部13に供給する。

【0016】このように、従来のCD-Rドライブ装置は、データを記録または読み出しをしている、ビットトラックの線速度が一定となる回転速度で回転するように、スピンドルサーボをかける。

【0017】

【発明が解決しようとする課題】しかしながら、従来のCD-Rドライブ装置は、記録したいビットトラックの線速度が一定となるまで、CD-R1の回転数が増加するのを待たなければならず、CD-R1へのデータの記録に時間がかかる。

【0018】本発明はこのような状況に鑑みてなされたものであり、迅速に、記録ができるようにすることを目的とする。

【0019】

【課題を解決するための手段】請求項1に記載のディスク駆動装置は、装着されている情報記録媒体の、データ

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が記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成手段と、線速度信号に対応するクロックを生成するクロック生成手段と、クロックに基づいて、情報記録媒体にデータを記録する記録手段とを含むことを特徴とする。

【0020】線速度信号は、Wobble信号から生成することができる。

【0021】記録手段は、情報記録媒体に対してデータを記録する光を発する光発生手段を含み、クロックに基づいて、光発生手段を駆動する駆動信号を補正する駆動信号補正手段を更に設けることができる。

【0022】ディスク駆動装置は、クロックに基づいて、記録手段の情報記録媒体に対してデータを記録するレーザ光の強度を調整する調整手段を更に設けることができる。

【0023】請求項5に記載のディスク駆動方法は、装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成ステップと、線速度信号に対応するクロックを生成するクロック生成ステップと、クロックに基づいて、情報記録媒体にデータを記録する記録ステップとを含むことを特徴とする。

【0024】請求項6に記載の記録方法は、装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号を生成する線速度信号生成ステップと、線速度信号に対応するクロックを生成するクロック生成ステップと、クロックに基づいて、情報記録媒体へのデータの記録を制御する記録制御ステップとを含む処理を実行させるコンピュータが読み取り可能なプログラムが記録されていることを特徴とする。

【0025】請求項1に記載のディスク駆動装置、請求項5に記載のディスク駆動方法、および請求項6に記載の記録方法においては、装着されている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号が生成され、線速度信号に対応するクロックが生成され、クロックに基づいて、情報記録媒体にデータが記録される。

【0026】

【発明の実施の形態】図2は、本発明に係るCD-Rドライブ装置の一実施の形態の構成を示すブロック図である。従来の場合と対応する部分には同一の符号を付してあり、その説明は、適宜省略する。スピンドルモータ41は、スピンドルを角速度一定である所定の回転速度で回転させる。スピンドルに装着されているCD-R1は、角速度一定である所定の回転速度で回転する。スピンドルモータ41は、スピンドルの回転速度に比例した電圧を、FG (Frequency Generator) 信号として、CAV (Constant Angular Velocity) コントローラ42に出力する。

【0027】CAVコントローラ42は、スピンドルモータ41から供給されたFG信号を基に、スピンドルモータ

41が角速度一定である所定の回転速度で回転するように、スピンドルドライバ13を制御する。

【0028】RF処理部43は、検出器で検出された信号から、ビットに対応するRF信号を生成し、EPMデコーダ17に出力するとともに、検出器で検出された信号から、案内溝に対応するWobble信号を生成し、ATIPデコーダ/記録クロック生成部44に出力する。本発明に係るCD-Rドライブ装置のRF処理部43がATIPデコーダ/記録クロック生成部44に出力するWobble信号は、CD-R1の角速度が一定なので、光学部13が記録または読み取りしているビットトラックの位置によって、その周波数および復調周波数が変化する。

【0029】ATIPデコーダ/記録クロック生成部44は、RF処理部43から供給されたWobble信号を基に、Wobble信号の周波数および復調周波数に対応した所定の周波数の記録クロックを生成して、EPMエンコーダ45、書き込み適応処理部46、およびCPI47に供給するとともに、スピンドルの回転を示すデータをCD-R0エンコーダ/デコーダATIPインターフェース18に出力する。

【0030】EPMエンコーダ45は、ATIPデコーダ/記録クロック生成部44から供給された記録クロックを基に、CD-R0エンコーダ/デコーダATIPインターフェース18から入力されたデータから、EPM信号を生成して、書き込み適応処理部46に出力する。

【0031】書き込み適応処理部46は、EPMエンコーダ45から供給されたEPM信号、およびATIPデコーダ/記録クロック生成部44から供給された記録クロックを基に、RF信号を生成して、光学部13に供給する。書き込み適応処理部46は、CPI47から供給されるデータに基づき、光学部13がCD-R1に照射するレーザ光の強度を制御する。 *

$$RF = (AP + BP + CP + DP)$$

増幅器72-1乃至72-4はまた、信号AP、BP、CP、およびDPをそれぞれメインサンプルホールド回路74に出力する。

【0038】メインサンプルホールド回路74は、所定のA/D (Analog To Digital) 変換の作業が終わるまで、信号AP、BP、CP、およびDPをサンプルホールドするとともに、それらの信号を増幅器75に出力する。メインサンプルホールド回路74は、CD-R1にデータを書き込んでいるとき、信号AP、BP、CP、およびDPをサンプルホールドして出力し、CD-R1にデータを書き込む前または書き込んだ後、信号AP、BP、CP、およびDPをサマ

$$FE = (AP + CP) - (BP + DP)$$

増幅器75は、更に、入力された信号AP、BP、CP、およびDPから、次式(3)に従って、MP (Main Push Pull) 信号を演算し、スイッチ79および差動増幅器8★

$$MP = (AP + DP) - (BP + CP)$$

AGC回路76は、入力された信号APおよびDPを加算し

* 【0032】CPI47は、ATIPデコーダ/記録クロック生成部44から供給された記録クロックの周波数を基に、書き込み適応処理部46が光学部13のレーザ光の強度を制御するためのデータを生成して、書き込み適応処理部46に出力する。

【0033】(R-1)にデータを記録するとき、光学部13は、書き込み適応処理部46から供給された、RF信号を基に、レーザ光の強度を変化させる。

【0034】図3は、光学部13の検出器およびRF信号処理部43の構成を示す図である。光学部13は、内蔵するレーザダイオードより照射されたレーザ光を、CD-R1の信号面に照射する。このとき、照射される1本のレーザ光は、図示せぬグレイティング (回折格子) により信号読み取り (記録) 用の1本のレーザ光、およびトラックキングサーボ用の2本のレーザ光に分割される。すなわち、1本のレーザ光が、グレイティングにより3本のレーザ光に分割される。そして、CD-R1の信号面に3本のレーザ光を照射して得られる反射面からの3本のレーザ光は、それぞれ検出器71-1乃至71-3で受光される。

【0035】検出器71-1は、CD-R1から反射された信号読み取り用のレーザ光を、4分割されたセンサ乃至4で検出し、電気信号AP、BP、CP、およびDPにそれぞれ変換した後、増幅器72-1乃至72-4に出力する。増幅器72-1乃至72-4は、信号AP乃至DPをそれぞれ増幅し、加算器73に出力する。

【0036】加算器73は、増幅器72-1乃至72-4で増幅された信号AP、BP、CP、およびDPを、次式(1)に従って加算することで、RF信号を生成し、EPMデコーダ17に出力する。

$$【0037】$$

$$\dots (1)$$

※本図のみ行って (ホールドせずに)、増幅器75に出力する。

【0039】増幅器75は、入力された信号APおよびDPを加算して、加算して生成した信号をAGC (Automatic Gain Control) 回路76に出力するとともに、入力された信号BPおよびCPを加算して、加算して生成した信号をAGC回路77に出力する。

【0040】増幅器75は、また、入力された信号AP、BP、CP、およびDPを、次式(2)に従って演算し、RF信号を生成する。

$$【0041】$$

$$\dots (2)$$

★5の+入力端子に出力する。

$$【0042】$$

$$\dots (3)$$

た信号のレベルを所定の基準レベルと比較し、基準レベ

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ルと同一のレベルになるように増幅を調整して、差動増幅器78の正入力端子に出力する。

【0043】AGF回路77は、入力された信号BPおよびCPを加算した信号のレベルを所定の基準レベルと比較し、基準レベルと同一のレベルになるように増幅を調整して、差動増幅器78の正入力端子に出力する。

【0044】差動増幅器78は、振幅が調整された信号APおよびDPを加算した信号と、振幅が調整された信号BPおよびCPを加算した信号との差を算出して、スイッチ79に供給する。

【0045】スイッチ79は、光学部13から供給された信号を基に、CD-R1にデータを書き込んでいるとき、または書き込む前には、増幅器75から供給されたMPF信号をバンドパスフィルタ80に出力し、書き込んだ後に、差動増幅器85から供給された信号をバンドパスフィルタ80に出力する。バンドパスフィルタ80は、スイッチ79から供給された信号から、所定の周波数以下の成分、および他の所定の周波数以上の成分を除去して、Wobble信号として、ATIPデコーダ/記録クロック生成部44に出力する。

【0046】検出器71-2は、CD-R1から反射されたトラッキングサーボ用の第1のレーザ光を、2分割されたセンサE、Fで検出し、電気信号EP、FPにそれぞれ変換した後、増幅器81-1、81-2に入力する。増幅器81-1、81-2は、信号EP、FPをそれぞれ増幅し、
$$SP-P = (FP+HP) - (EP+GP)$$

差動増幅器85は、入力されたMPF信号、およびSP信号から、次式(5)に従って、PE信号を算算する。 ※

$$TB = MP-P - SP-P$$

次に、本発明に係るCD-Rドライブ装置が、Wobble信号およびMP-DEエンコーダ/デコーダATIPインターフェース14から供給されたデータを基に、CD-R1にデータを書き込む動作を図4のブロック図を参照して説明する。

【0051】バンドパスフィルタ80は、検出器71-1、増幅器73-1乃至73-4、メインサンプルホールド回路74、および増幅器75で生成されたMPF信号から、所定の周波数成分のみを抽出して、Wobble信号としてATIPデコーダ/記録クロック生成部44に出力する。

【0052】CD-R1は、図5および図6に示すように、ポリカーボネートで形成された透過層（基板とも称する）に、予めプリグループ（案内溝）が設けられている。CD-Rドライブ装置は、データを読み込むときに比較して、CD-R1にデータを書き込むときには、強いレーザ光を、プリグループに沿って照射して、記録層の有機色素を分解し、透過層を変形させることにより、CD-R1にビットを形成させる。CD-R1のプリグループは、図5に示すように、プリグループの所定の長さに対して、予め定められた数のウォブル（うねり）を有する。従って、プリグループから反射したレーザ光は、プリグループの

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* 照し、サイドサンプルホールド回路83に出力する。検出器71-3は、CD-R1から反射されたトラッキングサーボ用の第2のレーザ光を、2分割されたセンサG、Hで検出し、電気信号GP、HPにそれぞれ変換した後、増幅器82-1、82-2に出力する。増幅器82-1、82-2は、信号GP、HPをそれぞれ増幅し、サイドサンプルホールド回路83に出力する。

【0047】サイドサンプルホールド回路83は、A/D変換の作業が済むまで、第1のトラッキングサーボ用の信号EP、FP、および第2のトラッキングサーボ用の信号GP、HPを、それぞれサンプルホールドするとともに、それらの信号を増幅器84に入力する。サイドサンプルホールド回路83は、CD-R1にデータを書き込んでいるとき、第1のトラッキングサーボ用の信号EP、FP、および第2のトラッキングサーボ用の信号GP、HPをサンプルホールドして出力し、CD-R1にデータを書き込む前または書き込んだ後、第1のトラッキングサーボ用の信号EP、FP、および第2のトラッキングサーボ用の信号GP、HPをサンプルのみ行って、増幅器84に出力する。

【0048】増幅器84は、入力された信号EP、FP、GP、およびHPから、次式(4)に従って、SPP (Side Push Pull) 信号を算算し、差動増幅器85の正入力端子に出力する。

$$\dots (4)$$

※【0050】

$$\dots (5)$$

ウォブルに対応した周期の振動を有する。

【0053】プリグループのウォブルに対応した周期の振動に対応する信号は、Wobble信号として抽出される。すなわち、Wobble信号の周期は、プリグループに対する、プリグループに照射されたレーザ光の移動速度、言い換えれば、ビットトラックの線速度に対応している。

【0054】また、Wobble信号は周波数変動しており、それを復調した信号に同期したクロック信号の位相はビットトラックにデータを記録する際の記録クロックの位相と同期している。

【0055】ATIPデコーダ/記録クロック生成部44の2値化回路101は、供給されたWobble信号を、予め定められた所定の閾値と比較して、2値化して、周波数比較回路102に出力する。周波数比較回路102は、2値化回路101から供給された2値化されたWobble信号と、分周回路105から供給された信号とを比較して、Wobble信号と分周回路105から供給された信号との周波数差に対応した電圧の信号をローパスフィルタ103に出力する。

【0056】ローパスフィルタ103は周波数比較回路102から供給された信号から、所定の周波数以上の成

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分を除去して、その信号をVCO(Voltage Controlled Oscillator)104に供給する。VCO104は、ローパスフィルタ103とローパスフィルタ111から供給された信号の加算後の電圧に対応する周波数の信号を生成して、分周回路105および分周回路112およびFDMエンコーダ45に出力する。

【0057】分周回路105は、VCO104から供給された信号を $1/106$ に分周して(例えば、VCO104から供給された信号が4.3218MHzであれば、22.65MHzになる)、周波数比較回路102に出力する。

【0058】位相比較器106は、2値化回路101から供給された2値化されたWobble信号とVCO104から供給された信号との位相を比較してその位相差に対応した電圧の信号をローパスフィルタ107に出力する。

【0059】ローパスフィルタ107は位相比較器106から供給された信号から、所定の周波数以上の成分を除去して、その信号をVCO108に供給する。また、ローパスフィルタ107の出力は2値化回路109にも供給され、2値化された信号は位相比較器110に出力する。

【0060】位相比較器110は2値化回路109から供給された2値化されたFMDT信号と分周回路112から供給された信号との位相を比較してその位相差に対応した電圧の信号をローパスフィルタ111に出力する。

【0061】ローパスフィルタ111は位相比較器110から供給された信号から、所定の周波数以上の成分を除去して、その信号をローパスフィルタ103の出力と加算してからVCO104に供給する。

【0062】分周回路112はVCO104から供給された信号を $1/686$ に分周して位相比較器110に出力する。

【0063】ATIPデコーダ/記録クロック生成部44から、EFMエンコーダ45に出力される信号はWobble信号の195倍の周波数で、かつFMDT信号のクロック周波数と位相が同期し、FMDT信号のクロック周波数の486倍の記録クロックとなる。

【0064】ATIPデコーダ/記録クロック生成部44は、Wobble信号の周波数が変化したとき、その変化に追従して、まず周波数が上記のようになり、次に位相がFMDT信号のクロックに同期するように作用し、記録クロックを生成する。

【0065】なお、2倍の記録クロックが必要な場合、分周回路105の分周率を $1/98$ 、かつ分周回路112の分周率を $1/343$ にすればよい。

【0066】EFMエンコーダ45は、CD-ROMエンコーダ/デコーダATAPインターフェース18から供給されたデータで、8ビットのデータに分割して、それぞれを14ビットの所定のデータに置き換える(置き換えられたデータは、連続する0が2つ以下16以下になる(1)と

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1との間に、0が1つだけ挟まれることがなく、また11以上の連続する0が表れることがない)。EFMエンコーダ45は、ATIPデコーダ/記録クロック生成部44から供給された記録クロックを基に、14ビットの置き換えられたデータに1が表れたとき反転する信号、すなわちEFM信号を生成する。

【0067】EFMエンコーダ45は、EFM信号を書き込み適応処理部46に出力する。書き込み適応処理部46のイコライザ131は、入力されたEFM信号を基に、EFM信号を生成する。

【0068】図7は、EFM信号およびEFM信号を基にCD-R1に生成されるビットを説明する例である。図7(A)に示す記録クロックを基に、EFMエンコーダ45が、例えば、図7(B)に示すように、1が3つ連続するEFM信号を生成したとき、イコライザ131は、記録クロックの1周期だけ短いEFM信号を出力する。

【0069】イコライザ131から供給されたEFM信号を基に、EFM信号を書き込み適応処理部46のレーザ駆動回路132は、光学部13にビットを形成させる強度のレーザ光をCD-R1に照射させる。

【0070】図7(C)に示すEFM信号を基に、CD-R1に形成されるビットは、図7(D)に示すように、その長さがEFM信号に対応する長さとなる。図7(E)に示すビットを光学部13の照射するレーザ光が走査することにより、EFM信号42が出力するEFM信号は、図7(E)に示すように、ビットの長さに対応した信号レベルを有する。

【0071】図7(E)に示すEFM信号から再生される再生2値化波形は、図7(F)に示すように、EFM信号を反転させたものと、同等となる。

【0072】本発明に係るCD-Rドライブ装置は、CD-R1を角速度一定である所定の回転速度で回転させるので、CD-R1の中心に近い内周のビットトラックとCD-R1の外縁に近い外周のビットトラックとは、線速度が異なる。また、Wobble信号を基にした記録クロックの周波数が異なる。

【0073】そこで、図8に示すように、同一のEFM信号から生成されるEFM信号は、CD-R1の中心に近い内周のビットトラックにデータを書き込む場合と、CD-R1の外縁に近い外周のビットトラックにデータを書き込む場合とでは異なる。

【0074】例えば、図8(A)に示すように、記録クロックのN周期、1であるEFM信号を基に、CD-R1の中心に近い内周のビットトラックにデータを書き込むとき、EFM信号は、記録クロックの(N-1)周期、1とされる。

【0075】記録クロックのN周期、1であるEFM信号を基に、CD-R1の外縁に近い外周のビットトラックにデータを書き込むとき、EFM信号は記録クロックの(N-X)周期、1とされる。Xは、0以下1以下のいずれ

の値であり、Xの値の決定の処理をライト・ストラテジ(Write Strategy)と称する。

【0076】ライト・ストラテジの処理は、図9に示すように、CD-R1の中心に最も近いピットトラックから外縁に最も近いピットトラックを、所定の数のM個のゾーン(領域)に分割して、それぞれのゾーン毎に、Xの値を予め決めておいても良い。書き込み適応処理部46は、ATIPデコード/記録クロック生成部44から供給された記録クロックの周波数を基に、予め記憶しているXの値を選択して、EPM信号を生成するようにしてもよい。

【0077】例えば、CD-R1の中心に最も近いピットトラックが含まれるゾーンである図中のZ(0)においては、Xを1とし、Z(0)の外周側に位置するゾーンであるZ(1)においては、Xを0.96とし、Z(1)の外周側に位置するゾーンであるZ(2)においては、Xを0.92とする。例えば、CD-R1の外縁に最も近いピットトラックが含まれるゾーンである図中のZ(0)においては、Xを0.84とし、Z(0)の内周側に位置するゾーンであるZ(0-1)においては、Xを0.86とする。

【0078】また、例えば、CPU47が、ATIPデコード/記録クロック生成部44から供給された記録クロックの周波数を基に、予め記憶しているXの値を選択して、書き込み適応処理部46に供給し、書き込み適応処理部46は、供給されたXの値を基に、EPM信号を生成するようにしてもよい。

【0079】更に、ジッタを低減するために、CD-R1にデータを書き込むときの光学部13のレーザダイオードの出力を、M個のゾーン毎に変更するようにしてもよい。

【0080】例えば、CD-R1の中心に最も近いピットトラックが含まれるゾーンである図中のZ(0)においては、光学部13のレーザダイオードの出力を1.20mWとし、Z(0)の外周側に位置するゾーンであるZ(1)においては、レーザダイオードの出力を0.96mWとし、Z(1)の外周側に位置するゾーンであるZ(2)においては、レーザダイオードの出力を0.92mWとする。例えば、CD-R1の外縁に最も近いピットトラックが含まれるゾーンである図中のZ(0)においては、光学部13のレーザダイオードの出力を1.20mWとし、Z(0)の内周側に位置するゾーンであるZ(0-1)においては、レーザダイオードの出力を1.14mWとする。

【0081】CD-R1の回転速度が固定されているので、CD-R1の半径方向に対する光学部13の位置をスレッドセンサーから取得すれば、CD-Rドライブ装置は、ピットトラックの線速度が算出できる。CD-Rドライブ装置は、CD-R1の半径方向に対する光学部13の位置を基に、ライト・ストラテジの処理を実行し、また、光学部13のレーザダイオードの出力を決定してもよい。

【0082】図10は、CD-Rドライブ装置の光学部13

の構成要件を説明する図である。例えば、光学部13のレーザダイオードは、最大出力を1.3乃至1.4mWとし、レーザ光を収束させる対物レンズは、開口数(Numerical Aperture)を0.5とする。また、光学部13は、高速な検出器71〜73乃至71〜73を使用して、レーザダイオードの出力のモニタには高速度フォトダイオードを利用する。レーザ駆動回路122には、高速電流スイッチを内蔵するなどである。

【0083】次に、CD-Rドライブ装置の書き込みの処理を図11のフローチャートを参照して説明する。ステップS11において、RP処理部43は、光学部13の検出器71〜73乃至71〜73から供給された信号を基に、Wobble信号を生成して、ATIPデコード/記録クロック生成部44に出力する。ステップS12において、ATIPデコード/記録クロック生成部44は、RP処理部43から供給されたWobble信号を基に、Wobble信号の周波数に対応する、所定の周波数の記録クロックを生成して、EPMエンコード45および書き込み適応処理部46に供給する。

【0084】ステップS13において、EPMエンコード45は、CD-ROMエンコード/デコードATAPIインターフェース18を介して、データを入力する。ステップS14において、EPMエンコード45は、記録クロックを基に、入力されたデータに対応するEPM信号を生成して、書き込み適応処理部46に出力する。ステップS15において、書き込み適応処理部46は、ATIPデコード/記録クロック生成部44から供給された記録クロックを基に、ライト・ストラテジの処理を実行して、EPM信号からEPM信号を生成する。

【0085】ステップS16において、書き込み適応処理部46は、ATIPデコード/記録クロック生成部44から供給された記録クロックを基に、光学部13のレーザダイオードの書き込み光出力を決定する。ステップS17において、光学部13は、書き込み適応処理部46から供給されたEPM信号を基に、CD-R1へのデータの書き込みを実行する。

【0086】以上のように、本発明に係るCD-Rドライブ装置は、CD-R1を、角速度一定である所定の回転速度で回転させて、CD-R1にデータを書き込むことができる。CD-Rドライブ装置は、CD-R1の回転速度を変化させずにデータを書き込むので、線速度一定でデータを書き込む場合に比較して、CD-R1の回転の速度の変化を待つ時間がなくなり、迅速にデータを書き込むことができる。

【0087】また、スピンドルモータ41が一定の速度で回転するので、AVコントローラ42は、従来のCD-Rドライブ装置のATIPデコーダ16に比較して、簡易な回路で構成できる。スピンドルモータ41の出力も、少なくとも、消費電力も少なくすることができ、

【0088】以上において、CD-Rドライブ装置として設

明したが、(b-RW (Compact Disc-Rewritable) ドライブ装置でもよい。

【0088】上述した一連の処理は、ハードウェアにより実行させることもできるが、ソフトウェアにより実行させることもできる。一連の処理をソフトウェアにより実行させる場合には、そのソフトウェアを構成するプログラムが、専用のハードウェアに組み込まれているコンピュータ、または、各種のプログラムをインストールすることで、各種の機能を実行することが可能な、例えば汎用のパーソナルコンピュータなどに、記録媒体からインストールされる。

【0090】この記録媒体は、図12に示すように、コンピュータと別に、ユーザにプログラムを提供するために配布される、プログラムが記録されている磁気ディスク351 (フロッピーディスクを含む)、光ディスク352 (CD-ROM (Compact Disc-Read Only Memory)、DVD (Digital Versatile Disc)を含む)、光磁気ディスク353 (MD (Mini-Disc)を含む)、若しくは半導体メモリ354などよりなるパッケージメディアにより構成されるだけでなく、コンピュータに予め組み込まれた状態でユーザに提供される、プログラムが記録されているROM 302や、記憶部308に含まれるハードディスクなどで構成される。

【0091】なお、本明細書において、記録媒体に格納されるプログラムを記述するステップは、記載された順序に沿って時系列的に行われる処理はもちろん、必ずしも時系列的に処理されなくとも、並列的あるいは個別に実行される処理をも含むものである。

【0092】また、本明細書において、システムとは、複数の装置により構成される装置全体を表すものである。

【0093】

【発明の効果】請求項1に記載のディスク駆動装置、請求項5に記載のディスク駆動方法、および請求項6に記載の記録媒体によれば、書き込まれている情報記録媒体の、データが記録されるトラックの線速度に対応する線速度信号が生成され、線速度信号に対応するクロックが生成され、クロックに基づいて、情報記録媒体にデータ

が記録されるようにしたので、迅速に、記録ができるようになる。

【図面の簡単な説明】

【図1】従来のCD-Rドライブ装置の構成を説明する図である。

【図2】本発明に係るCD-Rドライブ装置の一実施形態の構成を示すブロック図である。

【図3】光学部13の検出部およびRF信号処理部43の構成を示す図である。

【図4】本発明に係るCD-Rドライブ装置のデータを書き込む動作を説明するブロック図である。

【図5】CD-R1の構造を説明する図である。

【図6】CD-R1の構造を説明する図である。

【図7】EFM信号およびRF信号を基にCD-R1に生成されるビットを説明する図である。

【図8】ライト・ストラテジを説明する図である。

【図9】1トラック毎のライト・ストラテジおよびレーザダイオードの出力の調整を説明する図である。

【図10】CD-Rドライブ装置の光学部13の構成要件を説明する図である。

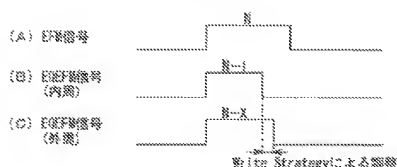
【図11】CD-Rドライブ装置の書き込みの処理を説明するフローチャートである。

【図12】記録媒体を説明する図である。

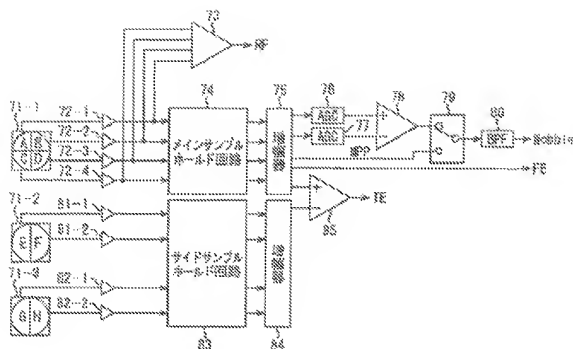
【符号の説明】

41 スピンドルモータ、42 AVコントローラ、43 RF処理部、44 ATPデコード/記録クロック生成部、45 EFMエンコーダ、46 書き込み適応処理部、47 CPU、101 2値化回路、102 周波数比較回路、103 ローパスフィルタ、104 VCO、105 分周回路、106 位相比較回路、107 ローパスフィルタ、108 VCO、109 2値化回路、110 位相比較回路、111 ローパスフィルタ、112 分周回路、121 イコライザ、122 レーザ駆動回路、301 CPU、302 ROM、303 RAM、308 記憶部、351 磁気ディスク、352 光ディスク、353 光磁気ディスク、354 半導体メモリ

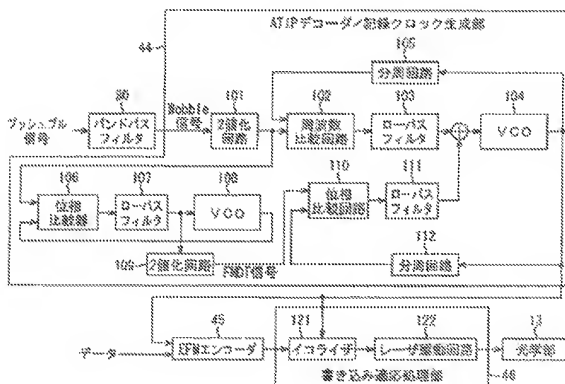
【図8】



【図3】



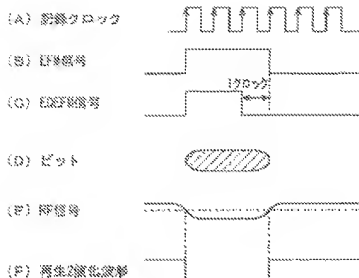
【図4】



【図5】

ゾーン	Z0	Z1	Z2	...	Z(N-1)	Z(N)
アドレス (8bit)	00:02:00~ 04:59:74	05:00:00~ 09:59:74	10:00:00~ 14:59:74	...	65:00:00~ 69:59:74	70:00:00~ 74:59:74
記録クロック (8bit)	4.3218~ 4.9588	4.9688~ 5.3987	5.3987~ 5.8286	...	8.7023~ 9.7037	9.7037~ 10.0078
書き込み電力 (mW)	0.0	0.4	0.9	...	11.4	12.0
ライト ストロブパル	N-1	N-0.96	N-0.92	...	N-0.86	N-0.80

【図7】



【図10】

項目	説明	理由
ハイパワレーザ駆動	対物レンズ射出最大13~14mW (ただし播送記録時)	各種0.5mW以下(1.0mW以下)の播送記録に対応する。
照射対物レンズ	NA=0.8	記録後のディスクの高温度化(焦じり化)のために、ビーム径を絞る。
記録方式によるトラッキングエラー検出	TE-検出方式 (A+10) - (B+10) - (C+10)	記録時のサーボ信号生成の方法として、記録中のサーボ信号生成には1ビットPush-pull法もしくは2PPM法しか選択がない。
高速セトリング4分SPBD内蔵	Head Sampling方式3分SPBDに対してMain/Driveビームでトランスインピーダンスを従来化	記録時のサーボ信号生成の方法として、記録中のサーボ信号生成には1ビットPush-pull法しか選択がない。
記録0.4mm以下内蔵	Write/Read用サンプルホールド型APDに対応	記録時のRead/Write Power制御に用いる。これもサンプルホールド方式を用いているので、高速モニタが必要となる。
高速電圧スイッチ内蔵	Speed/Power/OverDriveパワー用電圧スイッチはDriverに内蔵	オプティックの各種ライトトラッキング(記録/再生)に対応。
高感度増幅回路内蔵	高感度スイッチング回路をDriverに内蔵	ハイパワレーザのモードホッピング現象の低減のため。ただし完全スイッチングのため、発熱対策が必要。(100mW以下0.5mW)

【図12】

